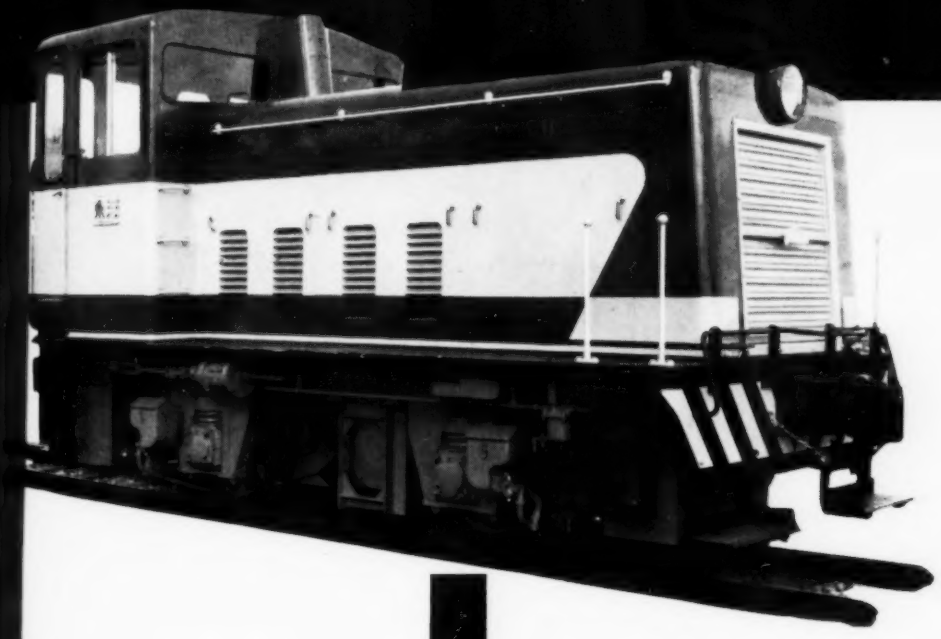
INTERNATIONAL
Railway Journal



- New Concepts in Shunting Locomotives
- Nouvelles Conceptions en Locomotives de Manœvres
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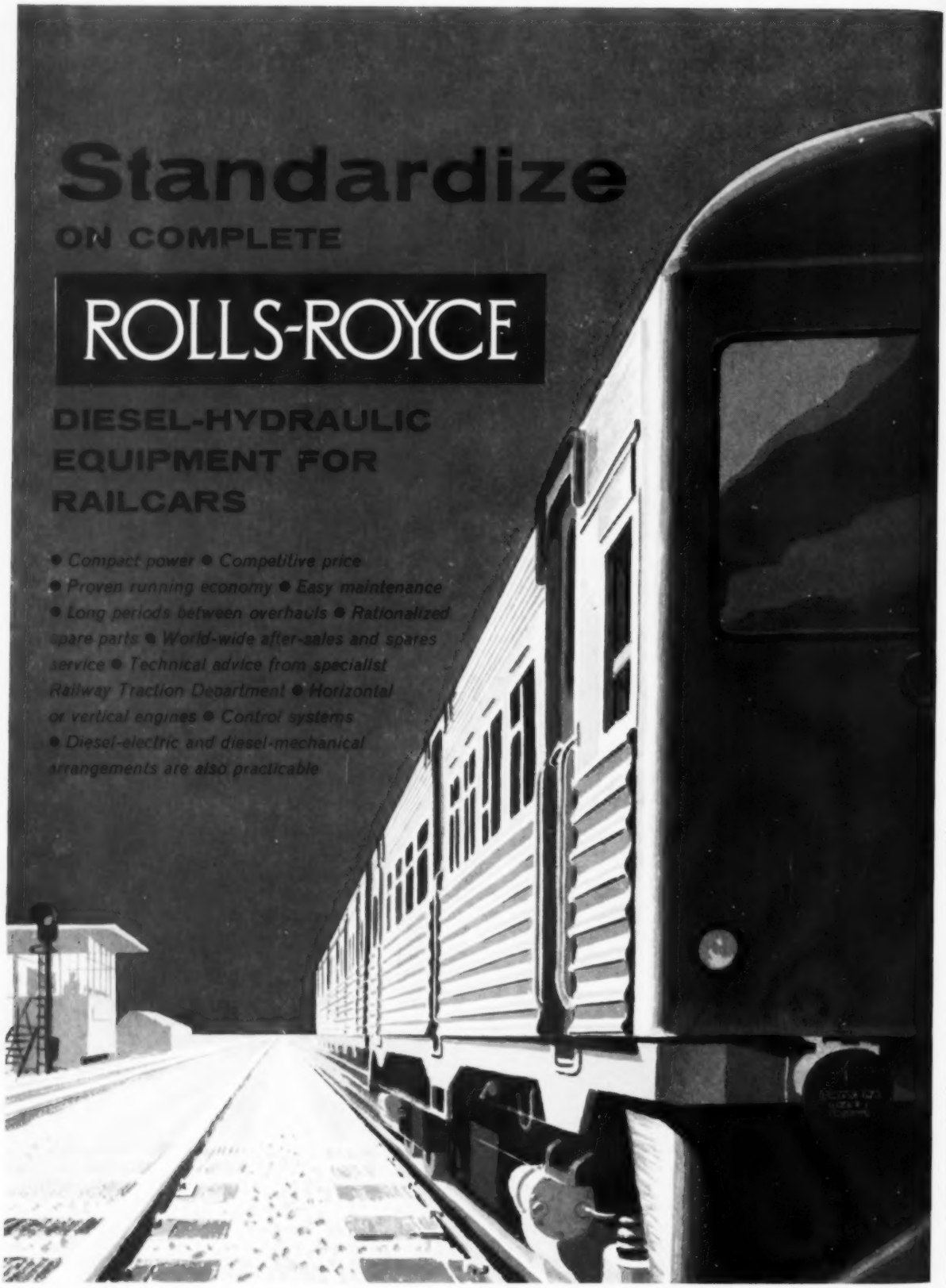

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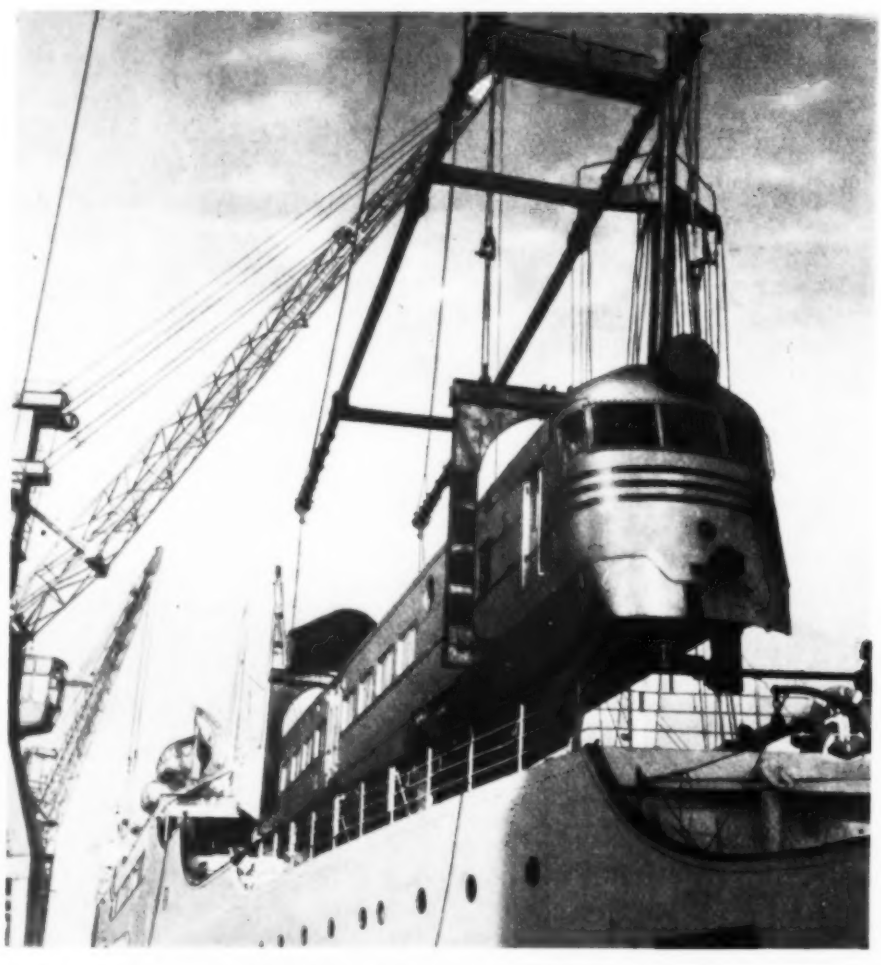

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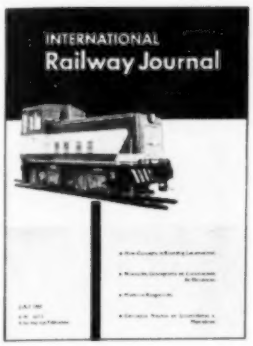

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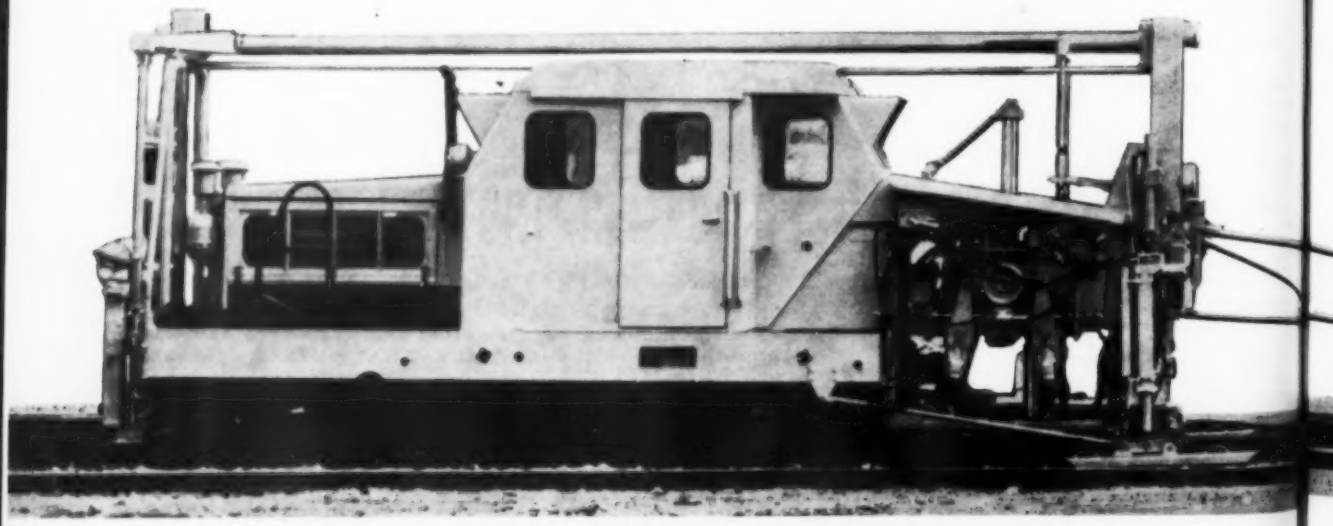

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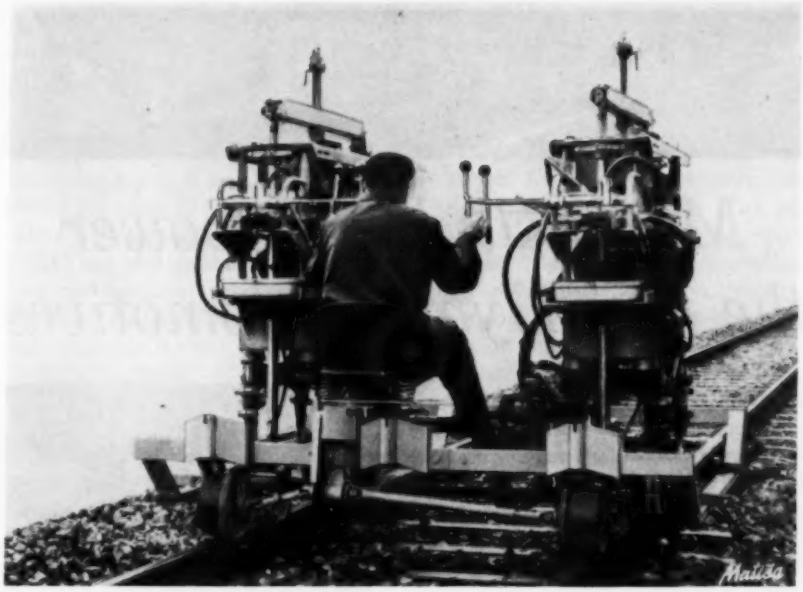

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Maybach diesels power the new Hymek locomotives

Bristol Siddeley Maybach* diesel engines have been chosen for the new Hymek diesel-hydraulic locomotives. 95 of these Type 3 locomotives have been ordered for main-line use on British Railways Western Region. This now brings the total order placed with Bristol Siddeley for British Railways to 286.

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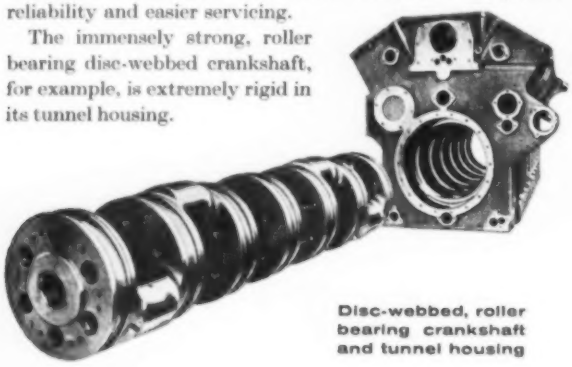

Disc-webbed, roller bearing crankshaft and tunnel housing

This results in very low main and big-end bearing wear. The pressure-oil cooling of the pistons gives effective heat dissipation which reduces liner and gas ring wear to a minimum.

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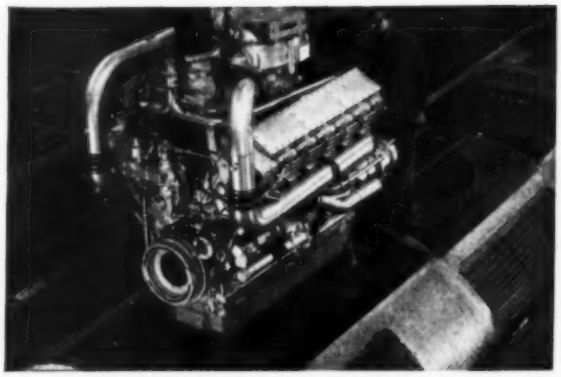

Maybach diesel engine being installed in D800 Class at Swindon.

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WORLD REPORT

Europe Launches TEEM Service

Europe's new Trans Europe Merchandise Express (TEEM) service, designed to meet road transport competition, is now in operation on 30 routes across Western and Central Europe. Trains are equipped with S wagons capable of operating at 100 km/hr. Minimum speed between stations is 85/km. Delays for customs procedures at borders are being reduced to two hours. The result will be faster service for shippers. Schedules between Amsterdam and Paris, for example, have been cut by five hours.

Automatic Coupling for Europe?

The ORE (research institute of the UIC) is examining proposals from manufacturers in an effort to select a universal automatic coupler for West European railways. Automatic coupling, introduced in the US in the last decade of the last century, has long been a problem for European railways. The cost of changeover has been the major stumbling block. A Special Automatic Coupling Commission has specified four prototypes for study including screw and non-screw types, with and without buffers. UIC has also consulted OSJD (the Communist bloc organization) concerning the adoption of a single automatic coupler for all of Europe. OSJD, however, is holding out for the Russian SA^3 type which lacks automatic airbrake coupling.

AUSTRALIA: Rudders Ltd., a freight forwarding organization, has launched a container service over the 3218-km route across Australia's socalled dead heart from Adelaide, capital of South Australia, to Darwin. Gauge variations require transfers at Port Pirie and Marree and the 1006-km section between the railheads at Alice Springs and Larrimah is handled by large table-top trucks hauling two dog trailers.

BRITAIN: Dr Richard Beeching, the new chairman of the British Transport Commission, will take at least a year to decide what changes are needed in the railway system. To this end he has initiated a study of the present working and prospects of the railways as a whole. At last month's press conference, however, he came out into the open with some of his first impressions. These included acceleration in the closing of branch lines, increases in fares, reorganization at managerial level and a sweeping review of the modernization plan. Curtailment of the modernization plan at this time would be a mistake, he said, although the studies now taking place may well cause modification at a later date. He does not believe that mainline passenger revenue can increase enough to offset freight losses. He sees general merchandise—as distinct from coal and minerals—as offering the best chance of expansion here. As indicated in the IRJ interview with Dr Beeching before he took up his appointment (IRJ May, p. 44), he believes it necessary to modernize the managerial structure—a "sprinkling" of top men will be recruited from outside to fill top jobs.

CANADA: The provincial government of British Columbia has advised sponsors of the proposed Pacific Northern Railway (IRJ, Jan. 1961, p. 56) that it does not wish to grant a one-year extension in the deadline by which construction work must begin. Instead, Transport Minister Westhood has offered these alternatives: (1) Let firm contracts by 1 Nov. to clear the first 100 miles (160.93 km) of the route, or (2) Give firm commitment by 1 Nov., together with a $200,000 deposit, ensuring that construction will be under way by 1 June 1962, on the first 150 miles (241.397 km) of the route. The railway was given until 17 July to accept one of the proposals.

CHILE: A special mission from the World Bank has arrived in Chile, at the government's request, to review a 10-year development program prepared by the Chilean Development Corp. The program outlines Chile's economic development needs, including transportation. The nine-man mission includes, as transportation economist, Dr. Hans Meyer of Switzerland (Division Chief in the Swiss Transport Ministry and Professor of Economics and Transport Policy, University of Bern); and, as advisor on railways, Sir Ralf B. Emerson of the UK (Chairman, Metro-Cammell; former Chief Commissioner, Indian Railways, and Chairman of the Nigerian Railway Corp.). The mission will remain in Chile about two months.

FINLAND: Premier Johannes Sukeslainen, who risked his minority government on the question of imports of French and British engines for the Finnish State Railways, has won a ringing vote of confidence from the Finnish Parliament. The Finnish Railways current modernization plan, which includes improvement of trackage, locomotive power, rolling stock and signaling equipment, is thus expected to proceed on schedule. Finnish locomotive manufacturers, under license from Alsthom of France, have started construction of heavy-duty 2800 hp diesel-electrics. The first units are scheduled to be completed in the spring of 1962. Finnish Railways have also received the first four passenger cars of a 15-car order from the builder, Maschinenfabrik Esslingen of West Germany. The new cars are of steel construction, are equipped with 80 seats each and are for use in second-class service. A spokesman for Finnish State Railways reports that Finland plans to build 250–300 additional cars similar in design to the new units. Electrification plans call for 20% of the rail network to be electrified within 10 years. Details of the plan are now undergoing final study before being presented to Parliament.

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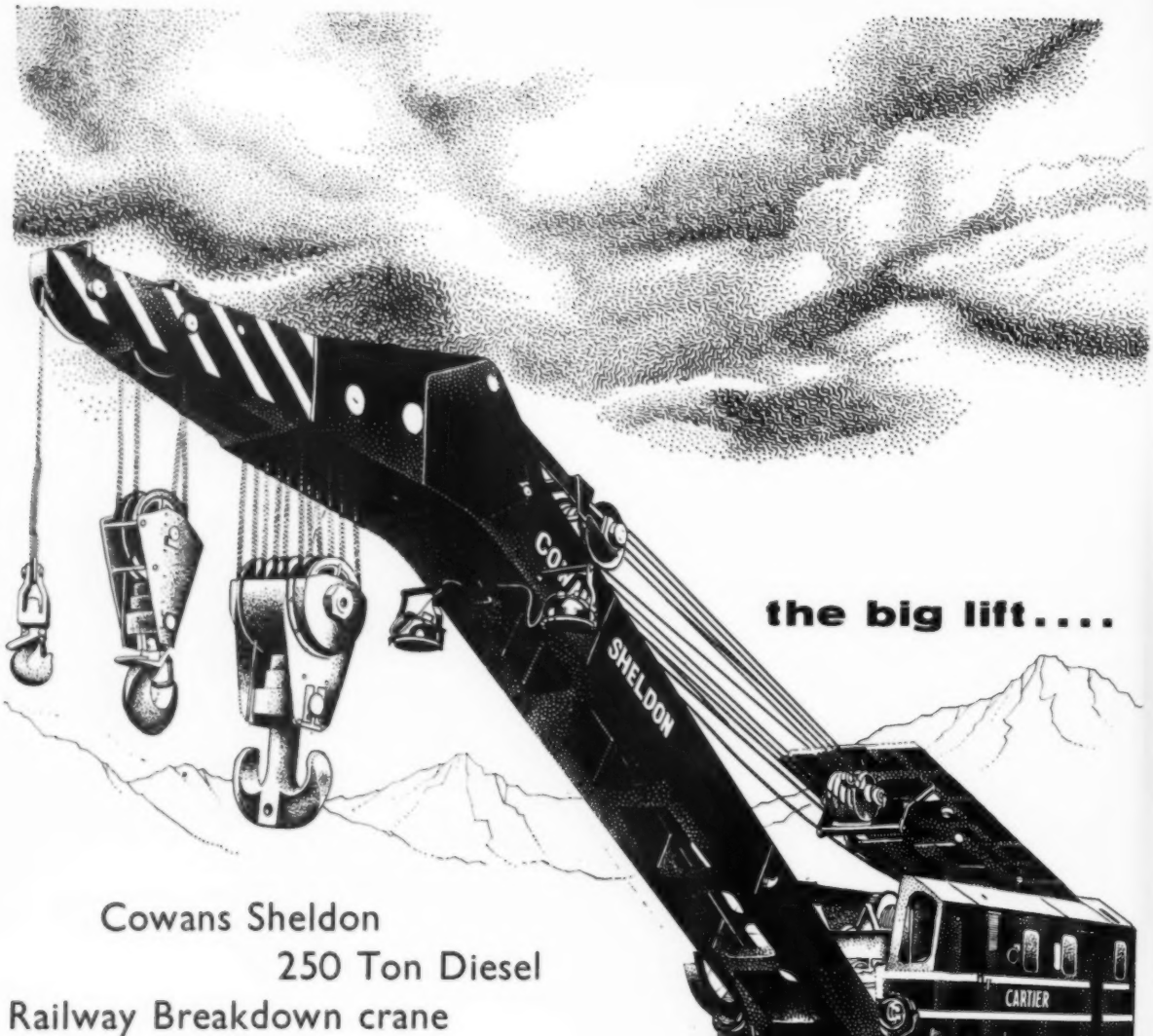

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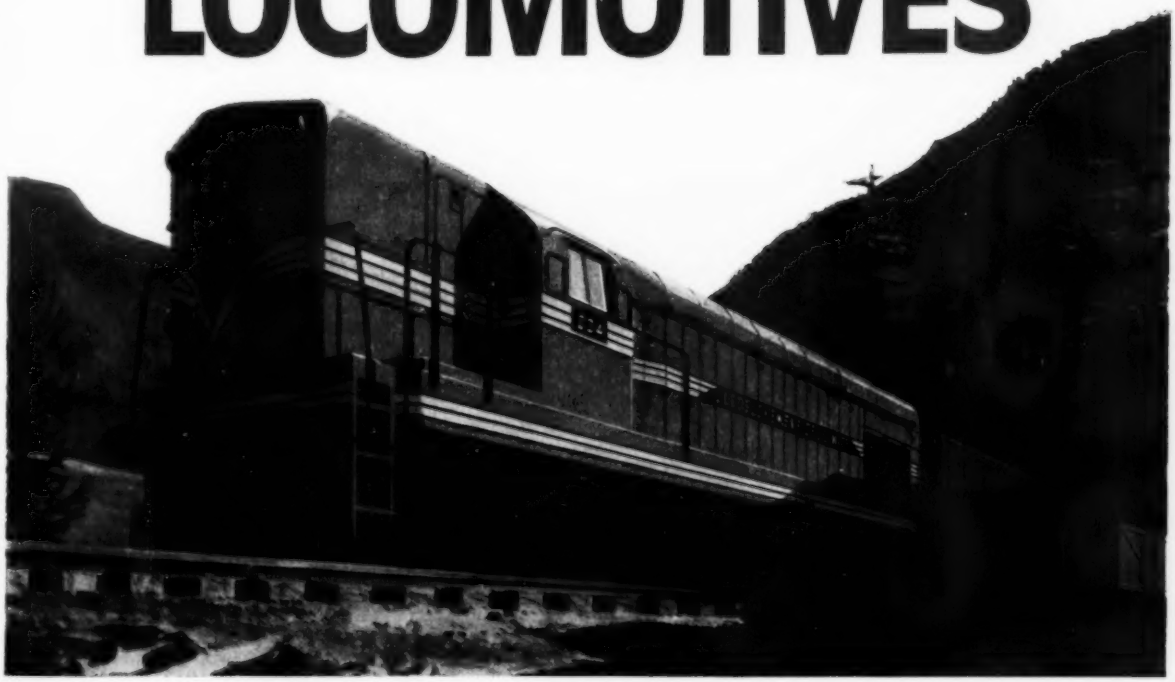
Yugoslav National Railways Order 57 more

GENERAL MOTORS LOCOMOTIVES



The successful performance of 20 General Motors Model G16 Diesel-Electric locomotives on Yugoslav Railways, hauling trains twice as long as the steam locomotives they replaced, has led to the purchase of 57 more of these 1950-H.P. units.

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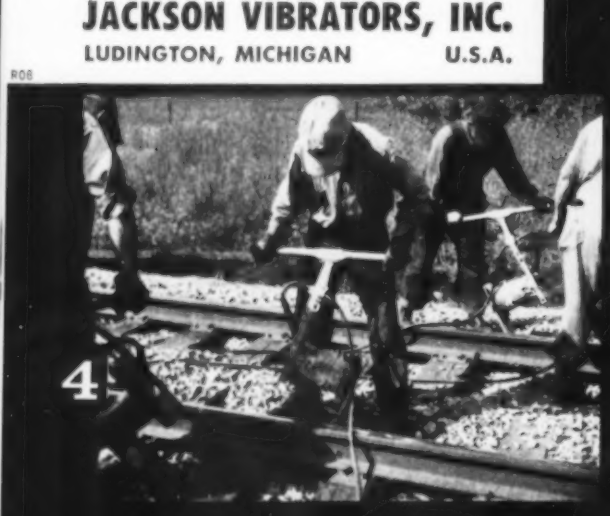

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World Market

▶ *Angola*—The Benguela Railway has reached agreement to construct a branch line to serve iron ore properties. Construction of the line, requiring about one year, will be supervised by Hojaard & Schultz of Copenhagen. The mines will be equipped by Krupp of Essen (West Germany) and the latter firm will also provide freight cars and locomotives. Cost of the new line is estimated at $524,000 (US).

▶ *Australia*—Responsibility for all after-sale servicing of the twelve 1425 hp G 12 diesel-electric locomotives which the New Zealand Railways are purchasing from General Motors' Montreal works has been assumed by the Australian GM affiliated builders, Clyde Engineering Co. Pty. Ltd., who have already supplied ten similar models to the NZR.

▶ *Austria*—During last year some 149 diesel locomotives worth a total of 66,000,000 schillings were exported. This compares with the 1959 figure of 129 units worth 58,000,000 schillings. Exports to the USSR experienced a particular rise, increasing from a total worth of 16,700,000 schillings in 1959 to a last year value of 39,600,000 schillings.

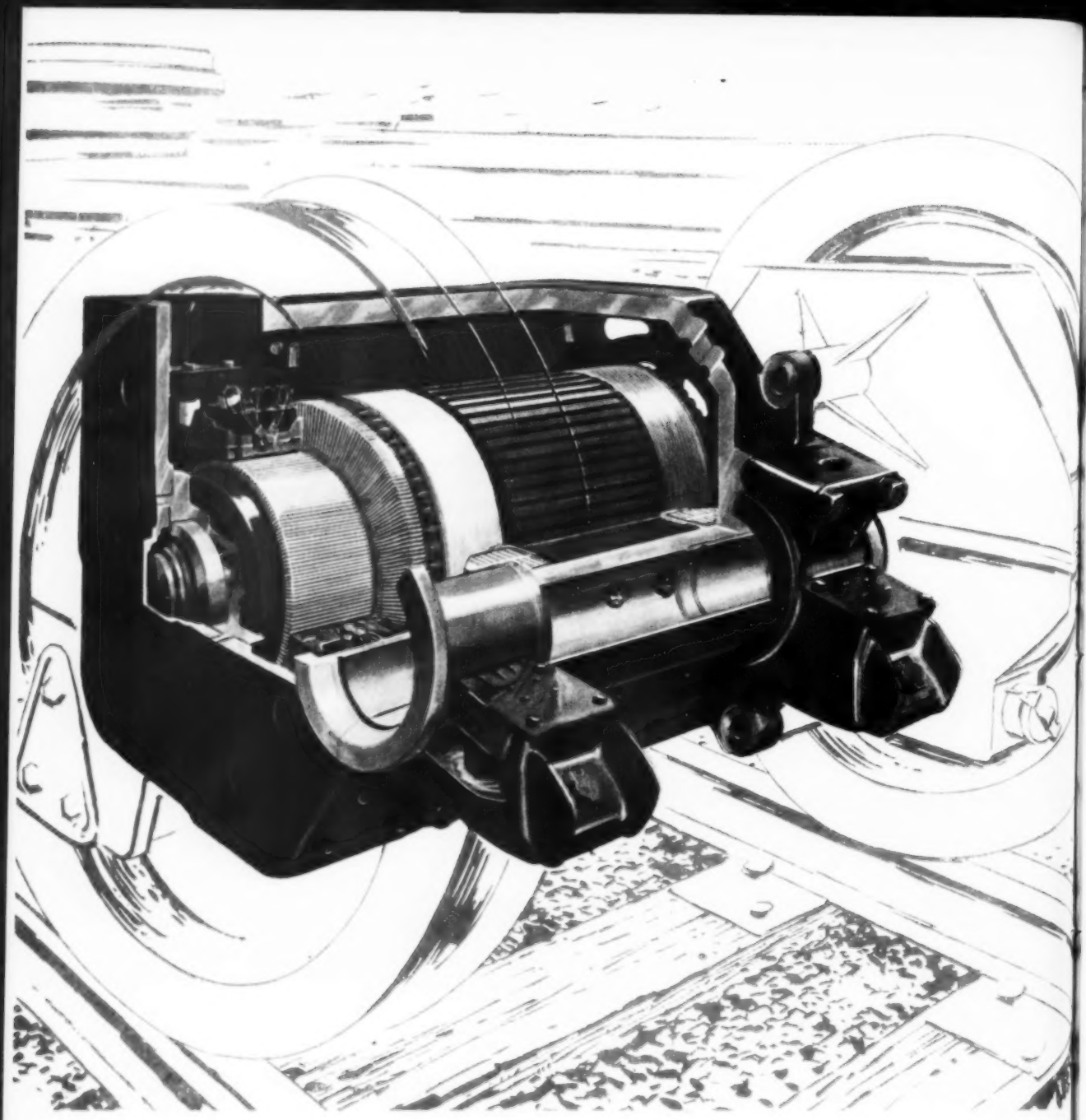
▶ *Britain*—An order for traction equipment worth £1.76 million has been placed with the General Electric Co. Ltd. by the Clayton Equipment Co. Ltd., bringing the total value of traction business now in hand by GEC to £6.5 million. This new order covers electrical equipment for 88 Davey Paxman powered Type 1 diesel-electric locomotives for British Railways. Delivery will begin in mid 1962.

▶ *Brazil*—A $23,500,000 (US) order for 180 locomotives (173 diesel-electric and 7 electric) for eight of Brazil's railroads has been placed with General Electric Co. (US) by the Brazilian Ministry of Transport. According to GE, the order is the largest ever placed by a national railway administration for locomotives. The diesel-electrics are U5B and U8B models developing 600 and 900 hp respectively. The all-electric units develop 3,000 rail-hp. Shipment of the first units is expected to begin soon.

▶ *Cambodia*—Construction of a major railway line, extending northward along the Mekong River, is anticipated as part of the nation's second Five-Year Plan. Meanwhile, work on the Phnom Penh-Sihanoukville railway, undertaken under the first Five-Year Plan, is expected to be complete by 1965.

▶ *Chile*—The Chilean State Railways have ordered from the French manufacturer, Ets. Brissoneau et Lotz, 49 diesel-powered locomotives. The grant of the contract was the result of an international tender in which 28 different manufacturers competed.

CONTINUED ON PAGE 17



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133-37

High continuous rating, sealed lubrication and high temperature insulation system assure long service life and low maintenance.

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Taper-bored motor support bearings, oiled by felt-wick lubricators, provide reduced bearing pressures, long life. Support bearing reservoirs, and the gearcase with its "bottom-fill" feature, cannot be over-filled.

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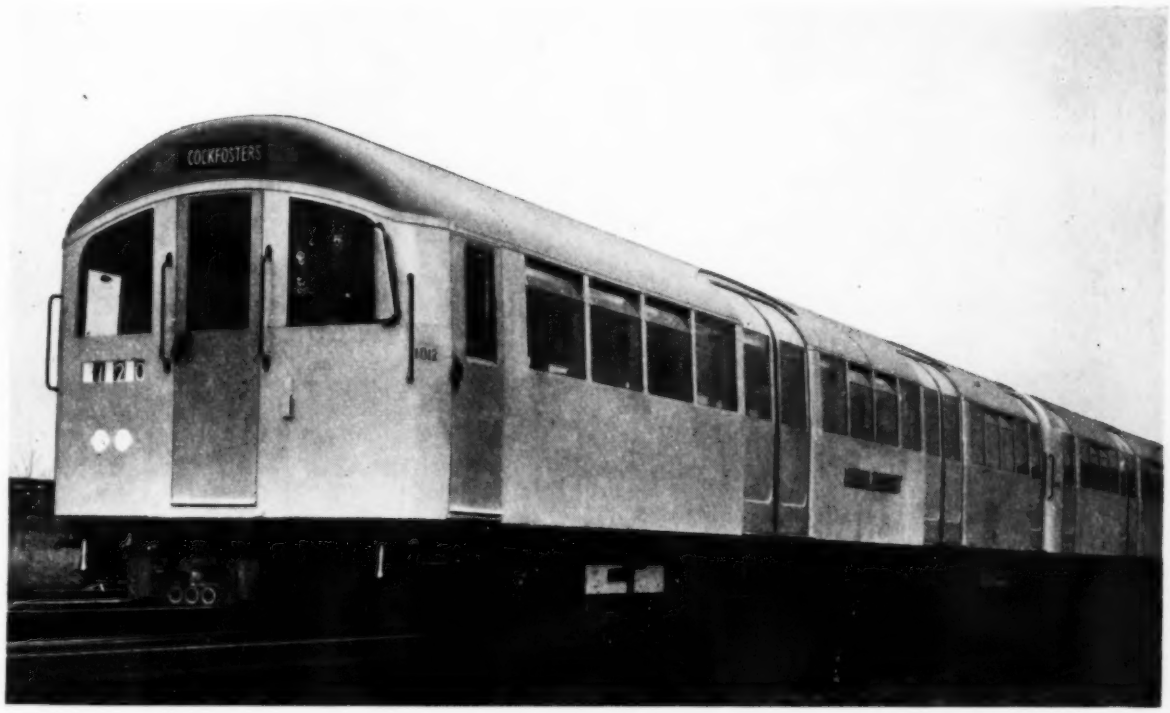
METRO-CAMMELL

TUBE CARS



FOR PICCADILLY & CENTRAL LINES

Photograph by courtesy of LONDON TRANSPORT EXECUTIVE

LONDON TRANSPORT

427 Cars have now been completed against the orginal contract for 589. An order for a further 450, making 1,039 has now been received.

METROPOLITAN-CAMMELL CARRIAGE & WAGON CO. LTD.

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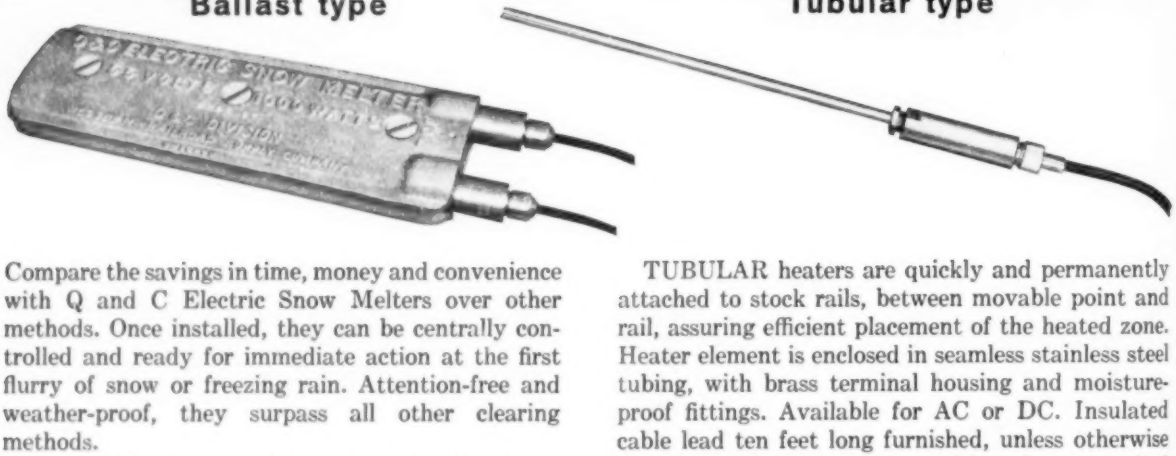
Keep Switches Open during winter's worst storms

Q AND C ELECTRIC SNOW MELTERS

Ballast type

Tubular type



Compare the savings in time, money and convenience with Q and C Electric Snow Melters over other methods. Once installed, they can be centrally controlled and ready for immediate action at the first flurry of snow or freezing rain. Attention-free and weather-proof, they surpass all other clearing methods.

BALLAST units are placed in a series, loosely on the ballast under the switch points, close to base of the rail. They are furnished for either 47 or 55 volts, AC or DC, and can be placed on 110, 220, 440 or 660 volt circuits. Each unit consumes 1000 watts, and attains a temperature of 284 degrees in fifteen minutes with a maximum of 650 degrees in approximately an hour.

TUBULAR heaters are quickly and permanently attached to stock rails, between movable point and rail, assuring efficient placement of the heated zone. Heater element is enclosed in seamless stainless steel tubing, with brass terminal housing and moisture-proof fittings. Available for AC or DC. Insulated cable lead ten feet long furnished, unless otherwise requested. Wattage, voltage and length are supplied to your specifications.

Anyway you look at it, Q and C Electric Snow Melters are your dependable, winter-wise solution for snow-free switches.

Plan now . . . drop a line for our brochure giving information necessary for a complete Q and C Electric Snow Melter Installation.

THE Q AND C DIVISION

WESTERN RAILROAD SUPPLY COMPANY
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Canada: Lyman Tube & Supply Company, Ltd., 5420 Pare Street, Montreal 9, Quebec

9078

(Advertisement)

RÉSUMÉ

Aiguillages ouverts, même durant les pires tempêtes d'hiver.

Q et C: fondeurs de neiges électriques.

Type BALLAST et Type TUBULAIRE

Comparez les économies de temps et d'argent et l'accommodement offerts par les appareils électriques Q et C pour faire fondre la neige, avec les méthodes concurrentes. Une fois installés, ils sont commandés d'une centrale et prêts pour action immédiate à la première rafale de neige ou pluie glaciale. Ils ne demandent aucune surveillance et sont à l'épreuve des intempéries. Ils surpassent toutes les autres méthodes de dégagement. Les unités BALLAST se placent en série, sans être serrées, sur le ballast en-dessous des points d'aiguillage, près du patin du rail. Elles fonctionnent sur 47 ou 55 volts.

Les éléments de chauffage TUBULAIRES sont attachés rapidement et de façon permanente aux contre-aiguilles entre le point mobile et le rail, assurant un placement efficace de la zone chauffée. L'élément chauffant est enfermé dans un tube en acier inoxydable sans soudure, avec une boite terminale en laiton et des garnitures résistant à l'humidité.

RESUMEE

Die Weichen bleiben, selbst im schwersten Wintersturm, offen!

Q und C Elektrische Schneeschmelzapparate.

BETTUNGSTYP und ROHRTYP

Vergleichen Sie die Zeit- und Geldersparnisse und die Bequemlichkeit der Q und C elektrischen Schneeschmelzapparate mit den sonstigen Methoden. Einmal installiert, können sie von einer Zentrale aus kontrolliert werden und sind beim ersten Schneegestöber oder Frostregen einsatzfertig. Sie erfordern keinerlei Pflege, sind wetterfest und übertreffen alle anderen Räumungsmethoden. Die Bettungseinheiten werden serienweise lose auf die Bettung und unter die Weichenstellen, dicht beim Schienenfuss, gelegt. Sie werden für 47 und 55 Volt geliefert.

Die röhrenförmigen Heizkörper werden schnell und dauerhaft an die Backenschienen zwischen den beweglichen Stellen und der Schiene befestigt und sichern ein wirksames Einlegen der geheizten Zone. Der Heizkörper ist in einem nahtfreien, rostfreien Stahlrohr mit einem Messing-Endgehäuse und feuchtigkeitsdichten Einlagen eingeschlossen.

RESUMEN

Mantenga los cambios abiertos aun en las peores tormentas invernales

Derritenieves eléctricos

Tipo DE BALASTO, Tipo TUBULAR

Compare el ahorro de tiempo, dinero y trabajo que los derritenieves eléctricos "Q and C" le ofrecen en comparación con otros métodos. Una vez instalados se pueden regular desde un punto central, siempre listos para entrar en acción a la menor señal de nieve o lluvia helada. Insuperables porque no requieren atención alguna y porque son a prueba de intemperie.

Las unidades para balasto se colocan en serie sobre el balasto, bajo las agujas del cambio, cerca de la base del riel. Vienen para 47 ó 55 voltios.

Los calentadores tubulares se conectan rápida y permanentemente a los rieles standard, entre la aguja movible y el riel, asegurando una ubicación perfecta de la zona de calor. El elemento calefactor está contenido en un tubo de acero inoxidable sin costuras, con cubiertas terminales de bronce y conexiones a prueba de humedad. Ambas unidades para CA o CC.

WESTERN Railroad Supply Company

World Market CONTINUED

▶ *Colombia*—The Colombian National Railways have called for bids to be submitted in Bogata not later than 8 August for 8 1200-1300 hp. and 8 600-700 hp. diesel-electric locomotives. The National Railways also received bids this month for 245 35-ton, double-bogie boxcars; 100 35-ton, double-bogie gondola cars and 40 35-ton, double-bogie flat cars.

The Antioquia Railway has issued calls for bids on three to five 1200-1300 hp. diesel electric or diesel-hydraulic locomotives.

▶ *East African Railways*—New projects valued at £3,000,000 have been approved by the Transport Advisory Council. These will include the installation of new track, the acquisition of a three-car diesel set and marshalling yard improvements.

▶ *Greek State and Peloponese Railways*—The Greek Government has received an offer from a West Berlin firm for delivery of rolling stock to the State and Peloponese Railway systems. The offer results from a Government decision to lay out $5.5 million for a five-year railway recovery program.

▶ *German Federal Railways*—Financing of a major electrification project has been boosted recently by completion of an agreement between the Federal Railway and the states of Hamburg, Bremen and Lower Saxony. Contributions of DM 57.2 million by the three states will make it easier for Deutsche Bundesbahn to float the DM 1000 million loan needed to carry out the electrification.

Essen manufacturers, Fried. Krupp Maschinenfabrik AG, have announced the completion of the first of 20 electric locomotives for Russia's Trans Siberian Railway. The rest of the order will be supplied by the end of the year.

▶ *India*—Bids are invited, until 16 August, on traction substations and switching stations (25 kv) by General Manager and Chief Engineer, Railway Electrification, Indian Railways, Calcutta 20. Specifications are available from Indian Railways for $21 (US) per set.

The Chittaranjan Locomotive Works produced 164 WG and 9 WT locomotives during 1959-1960, bringing the total production since its inception to 1,006.

▶ *Indonesia*—The Indonesian railway administration has placed orders for 2,500 railway freight cars of various types with the Czech foreign trade organisation Strojexport, of Prague.

The first of 80 four-axled 340-hp diesel locomotives ordered by the Indonesian State Railways from the West German concern, Fried. Krupp Maschinenfabrik, of Essen, has been officially handed over.

▶ *Italian State Railways*—The first of an order for 15 diesel-hydraulic mainline locomotives, built by CMI Ansaldo, has been received.

▶ *Mexican National Railways*—Centralized traffic control equipment will be installed on 96.5 km of the railway between Irapuato and LaGreiga. General Railway Signal Co. (US) will supply the system.

▶ *Netherlands*—Equipment for the installation of 43.45 km of centralized traffic control between Utrecht and Amersfoort has been ordered from General Railway Signal Co. (US). The new equipment will enable the railway to handle as many as 363 trains per day.

CONTINUED ON PAGE 19

AmBridge Sectional Plate is

unsurpassed for an underpass

Though normally used for drainage structures, USS AmBridge* Sectional Plate is also ideal for the construction of underpasses. The one below, at a railroad station, provides passage for a pedestrian walkway under railroad tracks, with a pipe structure 244 cm. in diameter, 20M long in the main body, with a 6M offset at one end. This entire structure was readily and quickly assembled from 15 tons of USS AmBridge Sectional Plate, with the ease typical of this material. Forms are unnecessary for pipe, pipe-arches and arches. Complete structures can be transported in one truck load, and even heaviest individual plates can be handled by small erection crews with light equipment. And steel means permanence, no breakage, extension if road or fill is to be widened – even complete relocation if desired. AmBridge Sectional Plate is available in a range of standard sizes. Engineering advice on unusual applications is available. For a 28-page catalog containing helpful information on design, sizes, weights, gauges and assembly instructions, write to United States Steel Export Company, 100 Church Street, New York 8, N. Y., U. S. A.

OTHER USS PRODUCTS

USS COR-TEN*, USS TRI-TEN* and USS MAN-TEN* High Strength Steels – Notable for weight reduction, abrasion resistance and resistance to atmospheric corrosion. Suitable for railway cars of all sizes and designs.

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USS AmBridge* Drain Pipe
Nestable Culvert Pipe
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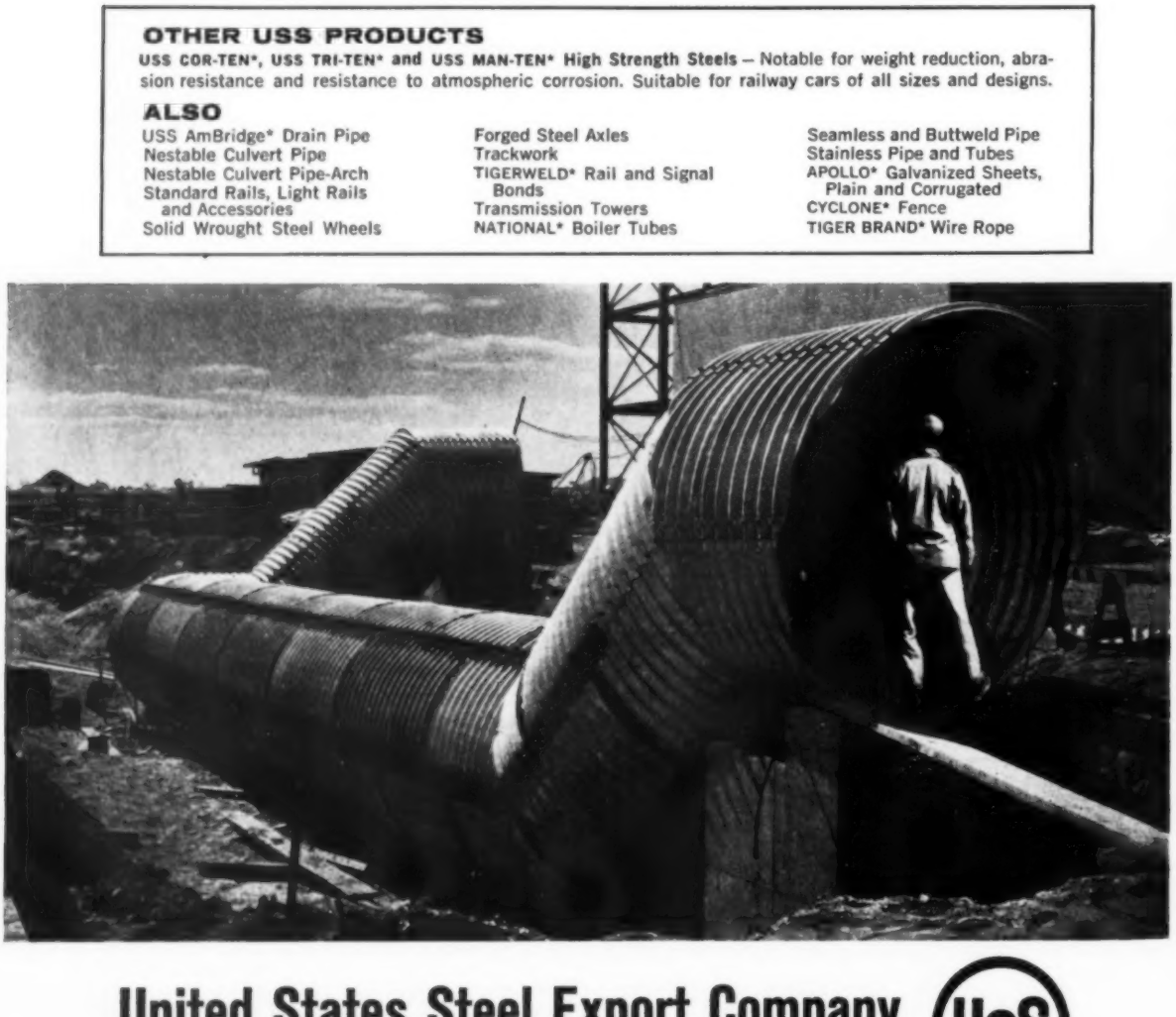
NATIONAL* Boiler Tubes
Seamless and Buttweld Pipe
Stainless Pipe and Tubes
APOLLO* Galvanized Sheets, Plain and Corrugated
CYCLONE* Fence
TIGER BRAND* Wire Rope



United States Steel Export Company

100 Church Street, New York 8, N. Y., U. S. A.

*Trademarks

(Advertisement)

RÉSUMÉ

Insurpassable pour les passages inférieurs

Ce passage inférieur pour piétons se compose de 15 tonnes de tôles profilées de AmBridge* de la USS. La structure des tubes a 244 cm de diamètre, 20 m de long dans le corps principal, 6 m de saillie à un bout. Ces structures se transportent en une seule charge de camion et peuvent être montées sans coffrages par de petites équipes utilisant un outillage léger. Grâce à l'acier il n'y aura pas de rupture, l'extension et même la réinstallation sont faciles. Les tôles profilées AmBridge existent en une série de dimensions normales. On peut obtenir des conseils techniques. Demandez un catalogue gratuit à United States Steel Export Company, 100 Church Street, New York 8, N.Y., U.S.A.

RESUMEE

Für Unterführungen unübertroffen!

Diese Eisenbahnunterführung für Fussgänger ist aus 15 Tonnen USS AmBridge* Profilblechen zusammengebaut worden. Das Rohrgefüge hat einen Durchmesser von 244 Zm, eine Länge im Hauptkörper von 20 M und einen Absatz von 6 M am einen Ende. Diese Gefüge können in einer einzigen Wagenladung transportiert und ohne Benutzung von Formen, von einer kleinen Mannschaft mit Hilfe leichter Geräte errichtet werden. Stahl vermeidet Brüche, ermöglicht eine leichte Ausdehnung und sogar wiederholte Verwendung. AmBridge Profilbleche werden in einer Serie von Standardgrössen geführt. Technische Beratung steht zur Verfügung. Kataloge werden kostenlos verabreicht. Wenden Sie sich an United States Steel Export Company, 100 Church Street, New York 8, N.Y., U.S.A.

RESUMEN

Superior para un paso inferior

Este paso inferior para peatones se fabricó con 15 toneladas de plancha seccional USS AmBRIDGE*. La estructura tubular tiene un diámetro de 244 cm, con 20 metros de longitud en la sección principal y desplazo de 6 metros en un lado. Estas estructuras, transportadas en un viaje de camión, pueden ser erigidas sin formas, requiriendo sólo cuadrillas pequeñas con equipos livianos. Y lo más importante: el acero representa seguridad contra roturas, extensión fácil y colocación uniforme. La plancha seccional AmBRIDGE se ofrece en una gran variedad de tamaños. Asesoramiento gratis. Si desea recibir catálogo gratis escriba a la United States Steel Export Company, 100 Church Street, Nueva York 8, N.Y., E.U.A.

USS

*TRADEMARKS

World Market CONTINUED

▶ *New Zealand*—A proposed deviation of the railway between Mangaweka and Utiku, some five miles south of Taihape, is being considered by the New Zealand Government. The new route would include construction of two or three large bridges. Relatively little earthwork would be involved. It is unlikely that the work could be started before 1963.

▶ *Pakistan Western Railway*—Work is expected to begin shortly on a new 321-km railway line extending southward along the Indus from Kot Adu, via Dera Ghazi Khan, to Kashmore. First phase of the project will be the Kot Adu-Bera Gazi Khan line. Cost of this section is estimated at 70,000,000 rupees.

Proceeds from a recent $6,500,000 loan from Development Loan Fund (IRJ, June, p. 9) are being used to acquire 23 broad — gauge, main — line locomotives from the US.

▶ *Poland*—Recently published figures indicate that during 1960 the Polish production of railway equipment was as follows (figures in parenthesis indicate increase over 1959): electric locomotives — 38, (26.7%); diesel locomotives — 144, (50%); electric rail cars (passenger) — 23, (109.1%); railway cars (passenger) — 660, (9.3%); railway cars (freight) — 13,891, (3.1%).

The Poznan diesel-locomotive plant in Poland exported at the end of last month four small diesels to the Argentine. This follows the export of ten similar units to North Korea. Polish sources state that African countries are at present showing interest in buying from the Poznan plant, and a firm in Andrychow, Poland is to work with the manufacturers in preparing the Poznan locomotives for tropical conditions.

Most of the orders placed with Swedish manufacturers in connection with the Polish rail electrification plans (IRJ, April, p. 52), have been withdrawn. This is stated to be the result of pressure from the Eastern European economic co-operation body "Comecon". Future orders are to be placed by Poland in East Germany, Czechoslovakia or the Soviet Union.

▶ *Senegal (Africa)*—Railroad improvements are one of the more important provisions in the nation's new Four-Year Plan.

▶ *Sweden*—The largest freight car so far ordered by the Swedish State Railways is to be delivered this summer. It has been designed with a view to meeting the growing needs of Swedish industry for rail transport of larger and heavier production units. The new car is being built by the South Swedish firm of Chr. Olsson, Falkenberg.

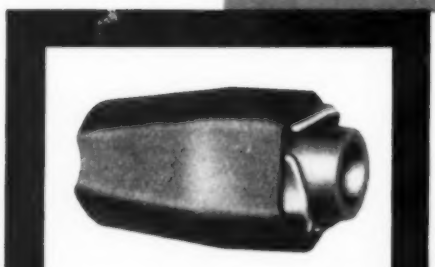
▶ *Sudan State Railways*—23 carriage chassis worth a total of $73,000 have been ordered from Metropolitan-Cammell Carriage & Wagon Co. Ltd., of the United Kingdom. The British company had previously received an order for 35 chassis from the Sudanese railways.

▶ *Taiwan*—The railway administration of Formosa has ordered General Railway Signal Co. equipment for installation of Type K2 centralized traffic control on 86.9 km of single-track rail between Chunan and Changhua.

▶ *Yugoslav State Railways*—Are expected to place orders for 50 electric locomotives in the 3000–400 hp range. Some of the locomotives may be constructed in Yugoslavia through licensing agreements.

Yugoslavia is reported to have standing orders from abroad for 1,542 freight and tank cars worth a total of $16,500,000 (US). Buyers include the USSR, East Germany, Hungary and the United Arab Republic.

UNIVERSAL FRICTION BUFFER



UNIVERSAL FRICTION DRAFT GEAR for Hook and Link Type Coupling

CARDWELL WESTINGHOUSE FRICTION DRAFT GEAR For Use With Automatic Coupling

(English, Español, Francais, Deutsch)

For smooth operation of freight trains, protection of valuable lading and longer freight car life . . . depend on these fully tested, rugged Cardwell Westinghouse devices. Railways anywhere in the world are invited to submit dimensions, specifications and special problems to our Engineering Department. Prompt reply assured.

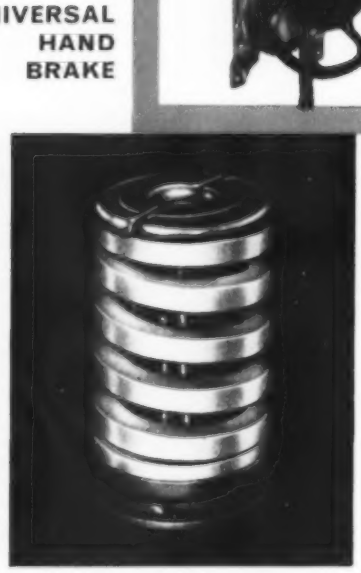
Para la operación suave de trenes de carga, protección de cargamentos valiosos y una vida más larga del vagón . . . dependa de estos dispositivos robustos, plenamente comprobados, marca Cardwell Westinghouse. Los ferrocarriles en cualquier parte del mundo quedan cordialmente invitados para someter dimensiones, especificaciones y problemas especiales a nuestro Departamente de Ingeniería. See aseguara una pronta respuesta.

Pour marche en souplesse des trains de marchandise, pour la protection des charges précieuses et pour une durée prolongée des wagons . . . vous pouvez compter sur ces accessoires Cardwell-Westinghouse. Nous invitons les réseaux de chemins de fer du monde entier à nous soumettre leurs dimensions, spécifications et problèmes spéciaux. Notre Service d'Etudes se fera un plaisir de vous répondre rapidement.

Der ruhige Betrieb von Güterwagen und der Schutz wertvoller Ladung ebenso wie eine längere Lebensdauer des Güterwagens ...sind abhängig von diesen völlig erprobten, robusten Cardwell Westinghouse Geräten. Eisenbahngesellschaften in aller Welt werden gebeten, sich mit ihren besonderen Problemen unter Angabe von Dimensionen und Daten an unsere technische Abteilung zu wenden. Eine promte Beantwortung wird zugesichert.

UNIVERSAL HAND BRAKE

CARDWELL FRICTION BOLSTER SPRING



CARDWELL WESTINGHOUSE

COMPANY—INTERNATIONAL DIVISION

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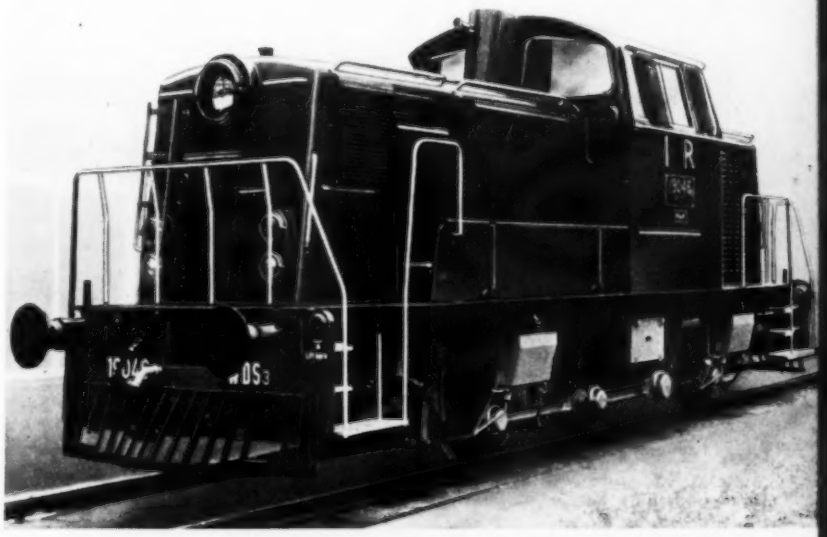
The Suri-Transmission

by M. M. Suri
Jt. Director (Diesels)
Ministry of Railways, India

The Suri-Transmission provides simple but highly efficient means for transmitting power in diesel rail traction units. It employs only two circuits, a Brockhouse type of convertor-coupling, and a fluid-mechanical-coupling. The two are arranged in parallel. The convertor-coupling can be arranged, according to particular needs of actual service, to cover the vehicle speed range from zero to 60–70% road speed. The fluid-mechanical-coupling comes into function from that speed onwards up to 100% vehicle speed. The first diesel locomotive incorporating the transmission has recently been shipped to India by the manufacturers, Maschinenbau Kiel (MaK), for service testing. In the following article, Mr. M. M. Suri, Jt. Director (Diesels), Research Design & Standardization Organization, Ministry of Railways, India, gives the general principles of construction and operation of his invention.



Suri transmission is being tested in a 650 hp diesel locomotive by MaK.
Transmission Suri en essai sur locomotive MaK 650 CV diesel.
Die Suri-Transmission wird von MaK in einer 650 PS-Diesellok erprobt.
MaK hace pruebas con la transmision Suri en una locomotora Diesel 650 CV.

A judicious superimposition of diesel engine characteristics obtained by "reverse governing" upon the Brockhouse convertor-coupling and the fluid-mechanical-coupling, makes the Suri-Transmission a very satisfactory means for universal application to rail traction. In the larger horsepowered vehicles, eg. 400 to 2000 hp and above, advantages of the Suri-Transmission summarised below are of even greater interest:

- Because of two circuits only, the construction is simple, compact and robust, low in weight and in price.
- Using a convertor-coupling, the need for automatic changeover is obviated, simplifying control systems, primary and secondary. Manual control over circuit changeover is provided enabling good drivers to effect maximum amount of saving in fuel. The transmission is inherently fool-proof against mismanipulation, and indifferent or poor driving cannot result in overall operational efficiencies any worse than those obtained with the best automatic transmission circuit changeover governors, even when the governors are fitted with load-speed correction mechanisms.
- The circuit changeover from the convertor-coupling to the fluid-mechanical-coupling occurs under full load and power of the diesel engine, without shock, and without interruption at any stage of tractive effort of the vehicle.
- The losses inside the transmission are a minimum, and both the hydraulic as well as the mechanical circuits yield optimum efficiencies in their respective ranges (Fig 2).
- The part-load efficiencies in the convertor-coupling are exceptionally high for which reason this transmission is ideally suited for shunting purposes.
- Because of highest attainable efficiencies available from the mechanical line of transmission, which can be engaged from 50–70% road-speed onwards, this transmission is ideally suited for mainline service.
- An added gain of the order of 1 to 2% in the overall efficiency of the locomotive accrues from operation in the purely mechanical line of transmission. All electric and hydraulic transmissions require power for dissipating the heat generated inside the transmission system. The mechanical line when engaged requires no cooling. In fact, advantage can be taken of this to relieve even the engine cooling circuit to some extent, by providing a heat exchanger between the transmission oil and the radiator water. This makes effective use of the radiation capacity of the transmission housing when running in the mechanical gear. This feature is of real interest to railways of tropical countries.

The exploitation of "reverse-governing" technique using the Suri-Governor on diesel engines developed in collaboration with Messrs. Maybach Motorenbau has played an important role in the success of this transmission and in its universal applicability. The use of the Brockhouse convertor-coupling, specially developed for use in the Suri-Transmission, also marks an important advancement in the technique of obtaining higher traction efficiencies for locomotion.

In rail traction the cost of fuel on any

CONTINUED

Rendement Elevé de la Transmission Suri

La Transmission Suri fournit un moyen simple mais à rendement élevé pour la transmission de la force motrice dans les engins de traction ferroviaire au diesel n'employant que deux circuits, un type Brockhouse de couplage convertisseur et un couplage mécanique hydrodynamique, les deux montés en parallèle. Le couplage convertisseur, selon les besoins particuliers en service, peut être réglé pour couvrir la gamme de vitesse-véhicule de zéro à 60–70% de la vitesse de route. Le couplage mécanique hydrodynamique commence à fonctionner à partir de cette vitesse jusqu'à 100% de la vitesse-véhicule. La première locomotive diesel pourvue de cette transmission a récemment été expédiée vers l'Inde pour y subir des essais. Cette locomotive, une des sept commandées par la direction des Chemins de Fer de l'Inde, a été construite en Allemagne par Maschinenbau Kiel (MaK). M. M. Suri, Co-Directeur (Diesels), Research Design & Standardization Organization, du Ministère des Chemins de Fer de l'Inde, ébauche dans cet article les principes généraux de la construction et du fonctionnement de son invention. Parmi les avantages, il cite la légèreté et le prix raisonnable de cette unité, qui est faite aussi bien pour le triage que pour le service sur les voies principales, et convient parfaitement pour le travail dans les régions tropicales.

Suri-Transmission erzielt höchste Leistugsfähigkeit

Die Suri-Transmission ist eine einfache aber höchts leistungsfähige Kraftübertragungsvorrichtung in Diesel-Schienenbetrieb-Einheiten. Sie benötigt nur zwei Stromkreise, eine Konvertor-Kupplung, Brockhouse-Typ, und eine mechanische Flüssigkeitskupplung. Die beiden sind parallel angeordnet. Dem jeweiligen Betriebsbedarf entsprechend, kann die Konvertor-Kupplung für Leistungen von Null bis 60 à 70% der Streckengeschwindigkeiten eingesetzt werden. Die mechanische Flüssigkeitskupplung tritt in Funktion, sobald sich die Geschwindigkeit erhöht und auf 100% der Streckengeschwindigkeit steigt. Die erste Diesellokomotive, die mit dieser Transmission ausgerüstet wurde, ist kürzlich nach Indien verschifft. Diese Einheit ist eine der sieben, die von der indischen Eisenbahnverwaltung bestellt und bei Maschinenbau Kiel (MaK) gebaut wurde. Herr M. M. Suri, Direktor der Diesel-Abteilung des Forschungs-, Planungs- und Normungsinstituts des indischen Eisenbahnministeriums, gibt in diesem Artikel die Grundprinzipien der Konstruktion und Bedienung seiner Erfindung bekannt. Zu ihren Vorzügen gehört ausserdem noch, dass ihr Gewicht und ihr Preis niedrig sind und sie sich sowohl für den Rangierbetrieb wie für den Vollstreckenverkehr, auch in tropischen Ländern, eignet.

La Transmisión Suri reclama gran eficacia

La transmisión Suri transmite, de manera sencilla pero muy eficiente, la fuerza motriz en unidades diesel de tracción. No emplea más que dos circuitos, uno del tipo embrague-convertidor Brockhouse, el otro del tipo embrague mecánico-hidráulico, los dos puestos en paralelo. El embrague-convertidor se emplea para las velocidades desde la parada haste el 60–70% de la velocidad de marcha. El embrague mecánico-hidráulico funciona desde esta velocidad hasta la máxima. La primera locomotora diesel equipada de tal transmisión se ha embarcado a India. Se trata de una de siete unidades compradas por la Indian Railway Board. Ha sido construida en Alemania occidental por la Maschinenbau Kiel (Mak). En este artículo el Señor M. M. Suri, Director (Diesels) de la Organización para Investigaciones, Diseño y Normalización del Ministro de Ferrocarriles de India explica los principios de la construcción y operación de su invención. Menciona las ventajas siguientes: peso ligero y precio bajo, puede servir tanto para las maniobras como para el servicio de línea, funciona bien en los trópicos.

large railway system of the world, generally represents the single largest item of expenditure. On the Indian Railways, for example, fuel costs amount roughly to 14% of the total operating expenses of the railway.

A close study, especially on Indian Railways, reveals that 80–90% of the total fuel consumption takes place between the speed range of 70–90% designed speed of the motive power vehicle—the locomotive or multiple unit high horsepowered railcars etc. It is, therefore, of the greatest importance that the efficiency of transmission in this operating range of the rail-vehicle should be the highest attainable.

It is known that the highest possible efficiency between the input and the output shafts of a transmission can be achieved only through pure mechanical means. Whenever means such as, electrical, hydro-dynamic, and hydrostatic are used, losses of energy occur in conversion of mechanical energy of the input shaft to electric, hydro-dynamic or hydrostatic energy and losses occur once again in reconversion of this back to mechanical energy at the output shaft. These losses at both conversions are inherent and inescapable unless the input and the output shafts are mechanically and directly brought together with rigid coupling means. Energy is then transmitted from the input to the output shaft without any losses.

Fuel Savings

While with existing electric transmission, efficiency of transmission at rail of the order of 85% is achieved; and with hydrostatic or hydro-dynamic (convertor types) approximately 80–82% is achieved; and with hydro-dynamic (coupling types) approximately 90% is achieved; with a pure mechanical transmission a total efficiency of transmission unit at rail of approximately 95% can be demonstrated on a locomotive. It is, therefore, possible to save fuel costs to the extent of 5–10% by adoption of pure mechanical transmissions in preference to other rail traction transmissions.

Although the advantages of higher efficiencies of mechanical transmissions have been well-known, their applications on rail traction units have been limited to units of a maximum of 400–500 hp. Application to larger units presents some basic difficulties more particularly in the case of rail traction.

A popular mode of coupling mechanically is by way of a plate clutch. The limitations of a clutch are readily under-

Suri Transmission (as built by MaK)

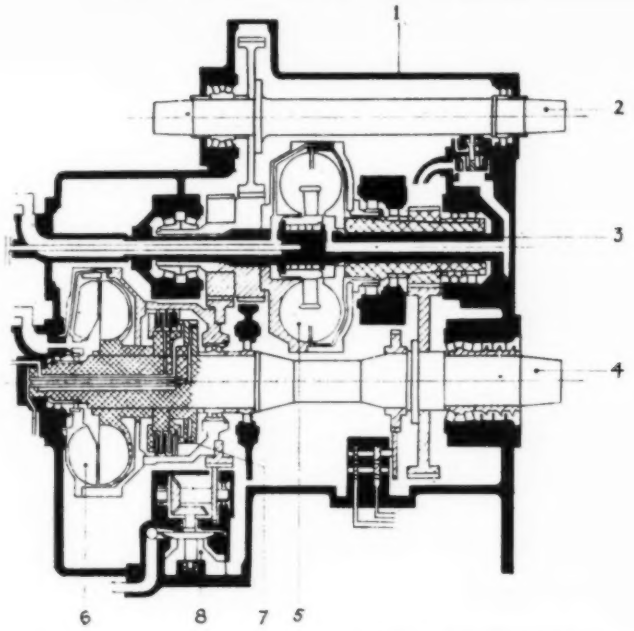


FIG. 1

1 Housing
2 Input shaft
3 Convertor reaction shaft
4 Output shaft
5 Brockhouse torque convertor
6 Fluid synchroniser
7 Plate clutch
8 Oil pump

stood. For example, when a train is picking up speed, at the point of change-over from one line of transmission with higher gear ratio to another, the input shaft and the output shaft to be coupled by the clutch are moving at different speeds. Thus when the two shafts are suddenly coupled, considerable momentum will have to be destroyed of all the primary members, shafts, gears, diesel engine etc., which are connected to the input shaft, in order to bring down the speed of the input shaft and synchronise it with the speed of the output shaft through the clutch. The shock load generated through change of momentum is inversely proportional to the time taken to effect the change. Therefore, if the clutch closes suddenly, effecting coupling in an instant, the resultant high shock load, especially in cases of higher horsepower vehicles, tends to damage the transmission parts as well as the diesel engine.

The types of mechanical couplings used in rail traction today are either friction plate clutches, claw clutches, or band-brake-type with epicyclic gearing. All these known methods achieve high efficiency of transmission, but result in disadvantages mentioned above, which limit their use to low horsepower vehicles only.

On the other hand, if the transition time is allowed to be larger and shock loading limited, as by permitting a progressively decreasing slip between the plates of a clutch till synchronisation is achieved, the plates of the clutch are subjected to considerable wear, necessitating frequent replacement. This is not acceptable in present-day rail traction because of the fact that electric and hydraulic transmissions now in use have already reached a stage in their development where, in spite of intensive use, frequent attention is unnecessary and parts do not wear, or require renewal, for periods of a few years at a stretch.

One means employed in the case of mechanical transmission to obviate these difficulties is through interruption of power from the engine when changing from one to another line of transmission. This is the case with automobiles or light railcars. In heavy duty rail traction, where the trailing weight is high compared to installed horsepower, this interruption of power is infavourably viewed. When a train is accelerating, especially on a gradient, and the speed has been achieved where a change of gear is required, any interruption of power instantly slows down the train. A continuity of tractive effort is most desirable for rail traction right through from zero to 100% road-speed. During the operation of changing from one to another line of transmission, especially in case of the mechanical line of transmission of known designs, care has to be exercised to put back the throttle of the diesel engine. Otherwise, during the momentary total, sudden offloading of the engine when one line is disengaged, and before the mechanical line can be engaged, the diesel engine and all primary components of the transmission would shoot up in speed; further aggravating the difficulties faced in engaging of the complimentary parts of the mechanical coupling. For this reason also, an interruption of transmission of torque has been found unavoidable in existing mechanical transmissions.

650 hp Shunter

The Suri-Transmission makes use of a fluid-mechanical-coupling wherein the mechanical coupling housing provides within it a small and inefficient fluid coupling (with high slip). This fluid-mechanical-coupling is arranged parallelly to a Brockhouse convertor. The operation of the whole transmission unit, its controls as well as the detailed features of design of the different individual components in combination, result in a transmission unit which successfully overcomes the problems enumerated above.

The transmission as applied to a 650-hp shunter is outlined in Fig. 1. The gear ratios selected are such that the torque convertor, when filled, accelerates the vehicle to approximately 70% maximum speed with the diesel engine running at full power and at full speed. The direct mechanical line is arranged to cover 70% to 100% speed. Fig. 2 shows tractive effort-speed curve.

At start, the torque convertor is filled with fluid while the direct mechanical line is kept fully disengaged until the vehicle speed reaches 70%. At this time the two complimentary parts of the mechanical coupling are running at different speeds, the primary part attached to the engine is running at 100% speed while the secondary part attached to the output shaft is running only at 70%. To change from torque convertor circuit to the mechanical line, the flow of fluid to the torque convertor is diverted to the mechanical coupling which houses a high slip small size fluid-coupling, eg. with a slip of 15% or so. As is well-known, a fluid coupling with this high slip is, in size and in weight, much smaller than the conventional traction coupling for rail traction, which has a slip of the order of 4–6%. It would be readily appreciated that a 15% slip coupling is very soft in its action and, therefore, when fluid is filled into this coupling its engagement is

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Suri Transmission – Characteristic Curves

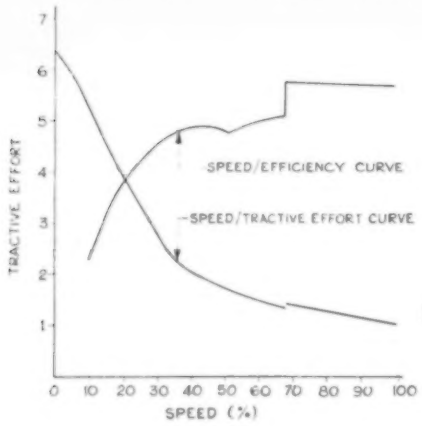

FIG. 2

Fluid-Mechanical Coupling Characteristics

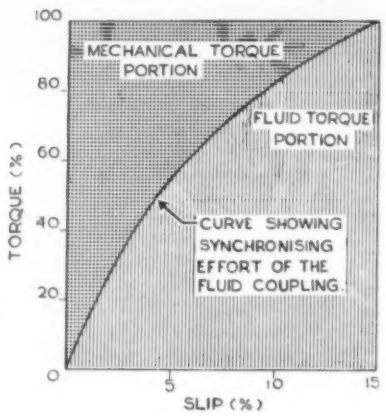

FIG. 3

SURI CONTINUED

gradual, cushioning the shock to primary and secondary parts.

The use of this small coupling, characterised by unusually high slip, solves the following problems immediately for rail traction:

• The size of the coupling and its weight, and hence the weight of the transmission unit is reduced. The simplicity and compactness of design are important for rail traction transmissions.

• The changeover from the torque convertor to the fluid coupling, even when carried out within a minimum of time, does not shock load the components of the transmission. With this arrangement, there is no need to effect interruption of torque. The change is carried out with the engine running at full power and speed.

• Because the fluid coupling acts softy due to its high slip, it is not important that the torque convertor be emptied instantly and the coupling filled slowly in order to avoid the two circuits with different gear ratios working in opposition to each other. In the Suri-Transmission, no elaborate mechanisms are required, nor any exacting time controls, for filling and emptying of the two circuits, because the risk of damage due to the two circuits remaining filled simultaneously and working in opposition to each other is very much reduced by the use of this unusually soft coupling.

• This feature of overlap of circuits resolves the problem of sudden offloading of diesel engine and the tendency to suddenly shoot up in speed at a gear change—a difficulty experienced in most cases on known transmissions. The engine is never offloading because before the first circuit, i.e. the torque convertor has fully disengaged, the fluid coupling has already come into function and taken the load of the engine.

It can be seen that without taking recourse to any elaborate control mechanism of filling and emptying of the various circuits, or providing the diesel engine with supersensitive and exacting governor controls, the change from one line to the other takes place with smoothness, with continuity of torque, and with the engine under complete control, simply by deploying the high slip of a small and inefficient fluid coupling in the transition stage. At this stage the torque convertor has been emptied and the high slip coupling filled. The engine speed has dropped to 35% with the vehicle still at 70% speed. This in effect means that partial synchronisation has already taken place between the two complimentary parts of the mechanical coupling. It is no longer necessary to engage the plate clutch too instantaneously or very slowly in order to avoid wear to clutch plates or prevent shock loading because:

• Partial synchronisation has reduced the difference between the input and output shafts to 15% and therefore, relative slip is now much less.

• At higher relative speed difference between input and output shafts, the coefficient of friction is lower, necessitating higher coupling force, which leads to much higher heat generation and excessive wear of plates. Partial synchronisation in itself results in prolonging the life of clutch plates to the desired minimum in rail traction.

• When the clutch plates are being engaged, full torque is already being transmitted through the fluid part of the fluid-mechanical-coupling and the clutch plates are only acting in addition. The fluid part is helping actively throughout, while the clutch plates are progressively taking over. The results of this technique of parallel working of fluid and mechanical coupling are very interesting. When the torque splits through two channels, ie., hydraulic and the clutch plates, the torque through the fluid part of the coupling is progressively reduced. Immediately that happens, as shown in Fig. 3, the slip of the fluid coupling reduces in accordance with well known fluid dynamic principles. As more and more torque is transmitted through the plate clutch and less and less through the fluid, the fluid acts more and more severely to synchronise the input and the output shaft speeds. Thus a high slip coupling initially acts as a partial synchroniser and then, in combination with a plate clutch, aids total synchronisation up to the moment of complete engagement.

• Results have shown that the engagement of the plate clutch in this manner does not cause any shock to the transmission and the engagement is hardly felt on a locomotive.

It is, therefore, a feature of extraordinary interest in the Suri-Transmission that an inefficient high slip coupling, which by itself would be an unacceptable component in a rail traction transmission, and a simple plate clutch which also is an unacceptable mode of coupling in a rail transmission of high horsepower, nevertheless, when combined to act in the manner explained, results in a very satisfactory transmission unit characterised by its exceptionally high efficiency, by delivery of uninterrupted torque from zero to full speed, and by smooth changeover from fluid to the mechanical circuit and vice-versa. To a railwayman, this means savings in fuel costs and ease of operation, both for shunting as well as for mainline operation.

Argentina's Minister of Economy Roberto T. Alemann talks about:

Proposed Reforms for the State Railways of Argentina

Argentina, with a population of 20,600,000, has 44,552 km (27,685 miles) of railways. By contrast, Great Britain, with more than twice the population, has approximately 75% as much railway mileage. Uneconomic rail mileage is, however, only one of the many problems besetting Argentina's railway system.

The system is divided into six separate railways—Belgrano, B. Mitre, Roca, San Martin, D. F. Sarmiento and Urquiza—with each generally operating lines of one or more of the pre-nationalization railways. But coordination has been made difficult by a multiplicity of gauges—1.676 m (24,733 km; 15,370 miles); 1.435 m (3,430 km; 2,131 miles); 1.00 m (15,533 km; 9,652 miles); 0.75 m (856 km; 532 miles).

Much of the rolling stock on the railway system is old. Well over half the freight and passenger cars are more than 40 years old. The railways operate 3,780 steam locomotives and only 720 diesels.

Latest reports indicate the system incurred deficits totaling $265,000,000 (US) in 1960. President Frondizi recently told the Argentine Congress that "drastic" measures would be taken to trim the railways—and the deficit—down to size.

Recent press reports from Buenos Aires have indicated increasing concern on the part of the Argentina government with conditions on the nation's railway system. The railways are held to be essential to the economy and growth of the country; yet operations have been conducted at the expense of high annual deficits.

International Railway Journal has discussed this situation in an exclusive interview with Dr. Roberto T. Alemann, Minister of Economy in the Argentine government. Dr. Alemann has recently been engaged in discussions with the World Bank and other credit sources as to Argentina's economic needs.

Dr. Aleman, who is 38, has taken an active role in the administration of President Arturo Frondizi. He served in the Provisional government, and, later, as Director of Economic and Financial Policy and Under-Secretary of the Minister of Economy.

His replies to questions submitted by International Railway Journal follow:

Q. What importance does the Argentine government attach to railways as a factor in the national economy?

A. Railways have been the key factor in Argentine development in the second half of last century and during the first decade of this century. Lately, this relative importance has not been so great. The Argentine railways, after they have undergone a profound reorganization, will again be of key importance for passenger transportation in suburban areas and long-range freight transport.

Q. Press reports say "drastic" measures are contemplated by the government to improve the railways. What measures, specifically?

A. The current deficit will be reduced; 4,000 kilometers (2,500 miles) of rail will be eliminated and their personnel transferred to local activities; management will be improved; accessory services such as bars, restaurants, work shops will be carried out by private enterprises; rules governing labor will be adjusted by the government; the personnel will be reduced; our investment program will be put into operation; and tariffs will be increased. The long-range program for rehabilitation of the railways is expected to be in operation next year.

Q. To what degree is over-employment a problem?

A. An estimated number of 70,000 to 80,000 out of 210,000 railwaymen will have to be transferred to other activities.

Q. Is Argentina burdened with uneconomic rail routes?

A. Yes. Fifty per cent of the track carries 85 per cent of the cargo. The other

CONTINUED

50 per cent is thus uneconomic under the present conditions inasmuch as a program to build some 13,000 kilometers (8,122 miles) of highways is now in progress.

Q. Can you outline, in terms of financial needs, the magnitude of the transport program you have in mind; how would funds be allocated among rail, highway, air and water transport facilities?

A. This is too early to allocate final estimates for the overall transport system in Argentina. So far, the 10-year highway program is estimated to cost the equivalent of $700,000,000 (US). A total of $134,000,000 will be financed by Eximbank, Development Loan Fund, and World Bank. Airports to be built within the next few years are estimated to cost $160,000,000.

The rehabilitation of the railways in terms of investment is so far not finally determined but will amount to several hundred million dollars. A few months ago, for an emergency program only, a figure of more than $200,000,000 was estimated. Water transport facilities have not so far been surveyed.

Q. How will the modernization program be financed? What kinds of new railway equipment are needed and where will it be purchased?

A. Some financing will be secured with the assistance of such agencies as the World Bank. The budget and other credit sources, preferably long-term ones, will cover the rest. All kinds of railway material will be needed, beginning probably with passenger cars for suburban transportation. Whenever local industry cannot supply the material, it will be purchased on a world-wide competitive basis.

Q. What specific railway rehabilitation programs have been undertaken since World War II and what is the general condition of the railway system at this time in terms of rolling stock, roadway, and other facilities?

A. The only major railway rehabilitation program since World War II has been a purchase program of $85 million financed by Eximbank and several suppliers of credit in Europe from 1956 to 1961. Since last year, a comprehensive survey of Argentine transport problems of railways and highways has been under way. Financed by the Special Fund of the United Nations and the Argentine government, the consulting engineers carrying out the job have been hired by the government with the assistance of the World Bank. The general condition of the railway system is bad.

Q. Has the special transportation report prepared under United Nations auspices received general acceptance by your government?

A. Yes.

(This report is entitled "Los Problemas del Transporte en la Argentina y la Orientacion de sus Soluciones" (in Spanish). It was published by the Consejo Economica para America Latina (United Nations), Santiago de Chile, September, 1958. There are two mimeographed volumes, a total of slightly less than 600 pages. The report presents a detailed analysis of the present development and condition of transport facilities (rail, highway, water, air) of Argentina; and the nation's need for rehabilitation and improvement of these facilities. The report concludes that: "The railways, assuming their adequate rehabilitation and modernization, will continue to be the basic means of transport for heavy traffic and for the greater part of long-haul transportation. This traditional economic function of railways will be reinforced by the development in the next ten years of basic industries, the necessities of which call for the potentialities and characteristics of railway transportation".

The report advises that railways have been losing ground to highway carriers in freight traffic because of an inadequate supply of cars and motive power. However, they are still hauling 1.5 times the ton-kilometers that are moving by truck. Railway passenger traffic, also, has not been growing because of insufficient facilities. It is estimated that railway passenger-kilometers should double in the decade 1956-67 and that railway freight tonnage should increase 96%. It is estimated that, in the 10 years ending 1967, the railways will need to acquire 1,000 diesel locomotives; 35,000 freight cars; 1,700 coaches for main-line service; 800 self-propelled cars and trailing cars; 275 coaches for electrified service; 100 baggage-mail cars—plus materials to electrify the General Roca Railway's suburban service (including 425 coaches); and a large amount of brake equipment and improved couplers.—Editor).

Q. What are the present conditions of highway development? Are paved highways generally limited to urban areas and nearby points?

A. Existing highways have improved remarkably in the last years and a new net of highways covering the main parts of the country is being built.

Q. Are highway and railway rates regulated by government in Argentina?

A. Only railway rates are regulated by the government.

Problèmes Ferroviaires Argentins

L'Argentine, population 20,6 millions, possède 44,552 km de voies, tandis que la Grande-Bretagne, plus de deux fois la population a environ 75% de cette distance d'acheminement. La distance d'acheminement inéconomique ne constitue qu'un des nombreux problèmes ferroviaires argentins. Des nouvelles récentes de Buénos Aires indiquent que le gouvernement argentin s'inquiète de plus en plus au sujet des chemins de fer du pays. L'International Railway Journal a discuté la situation dans un interview exclusif avec le Dr. R. T. Aleman, Ministre de l'Economie dans le Gouvernement Argentin et ses réponses aux questions posées sont formulées dans cet article.

Argentiniens Streckenproblem

Argentinien hat bei 20.600.000 Einwohnern ein Eisenbahnnetz von 44.552 km. Grossbritannien dagegen, hat mit seiner mehr als doppelten Bevölkerung ungefähr 75% mehr Schienenkilometer. Diese unwirtschaftlichen Schienenkilometer sind jedoch nur eins der vielen Probleme, die die argentinische Eisenbahnverwaltung bedrängen. Jüngste Presseberichte melden zunehmende Sorgen der argentinischen Regierung hinsichtlich des nationalen Eisenbahnsystems. International Railway Journal hat die Lage in einem exklusiven Interview mit Dr. Roberto T. Alemann, Wirtschaftsminister der argentinischen Regierung, besprochen und seine Antworten sind in diesem Artikel aufgenommen.

La Argentina tiene problemas de vía

La Argentina—población de 20.600.000—tiene 44.552 km. de vías férreas, en tanto que la Gran Bretaña, cuya población es dos veces más grande, tiene aproximadamente 75% de este kilometraje. Pero el kilometraje poco económico de vías férreas no es el único problema con que la red argentina ha de enfrentarse. Recientes noticias recibidas de Buenos Aires indican que el gobierno de la Argentina está preocupándose más y más por la condición de la red nacional. La International Railway Journal ha discutido la situación en una entrevista exclusiva con el Sr. Dr. Roberto T. Alemann, el Ministro de Economía del Gobierno Argentino. Este artículo contiene sus respuestas a las preguntas hechas.

ILO looks at

Modernization on the Rails

Railway transportation has undergone profound changes in recent decades under the influence of two major forces: technological development and competition. These changes—and their effect on railway employees—were the topic of discussion at the Seventh Session of the Inland Transport Committee of the International Labor Organization at Geneva in May.

Among the most spectacular of these changes is the switch from steam to electric and diesel traction. The change has come so fast that the steam engine, which had dominated the scene until ten years ago in the great majority of countries, is now clearly on its way out. On 28 March 1960, the last regularly scheduled steam locomotive in the United States moved into retirement. The Swiss Railways also virtually completed, during 1960, the electrification of both main and secondary lines. In the Netherlands all important lines have been electrified since the war and diesel traction introduced on other lines.

In some other countries, a complete switch-over is the avowed aim of investment policy, and considerable progress has already been made toward this end. Thus, in the United Kingdom, the modernization plan provides for the complete elimination of steam traction, and the last steam engine for home use has been manufactured in that country. The 19,000 steam locomotives in service in 1954, many of which were distinctly over age, will be brought down to 7,000 by 1963, while 2,300 diesel main-line engines and 2,000 shunting engines will have been brought into service, as well as 4,000 diesel multi-unit trains which will improve passenger services, particularly on short-distance shuttle services. By 1961 almost all passenger services will be operated by diesel or electric power although some 10,700 steam locomotives will still be in service. In Belgium a complete changeover is also the aim, and a first stage of electrification, covering 900 kilometres of line, has already been completed.

The development of railway transport in the USSR at present is characterized by the thoroughgoing reconversion of traction power. In accordance with the Seven-Year Plan for the development of the national economy (1959–1965), between 85% and 87% of total freight traffic on the railways will be moved in 1965 by electric and diesel power. The general plan for electrification of railway transport adopted in 1956 provided for 40,000 kilometres of railway-line to be electrified in 15 years. The 1959 total length of electrified lines was 10,000 kilometres and the Seven-Year Plan now provides for the electrification of some 20,000 additional kilometres. In addition, during this seven-year period diesel traction is to be introduced on a total of 58,000 kilometres; as a result, the total length of lines served by this type of traction will reach 70,000 kilometres in 1965. Steam traction should be completely eliminated by 1970.

In many other countries the replacement of steam traction is already far advanced and is planned to be taken further. Thus in France, by the end of 1959, about 6,600 kilometres of main line had been electrified. Though these constitute about 17% of the total length of line in operation, they carry a little over half the traffic of the whole country. In addition, over a thousand diesel-powered railcars run over many secondary lines, diesels are widely used for shunting and the use of high-powered diesels is being tried on certain main lines. The number of steam locomotives in service had dropped from 8,850 on 1 June 1950 to 3,884 on 1 June 1960.

In Austria, steam traction has dropped since 1950 from 71% to 36% of kilometres traveled, while electric traction has increased from 25% to 49% and diesel traction from 4% to 15%. In Norway, diesel or electric traction is stated to have replaced steam on a major proportion of trains, and in Sweden the locomotive-kilometres worked under steam have dropped from about 22 million to 5 million in five years. In Canada, the example of the United States has been followed and both the railway systems of that country have turned to

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A. Only railway rates are regulated by the government.

Problèmes Ferroviaires Argentins

L'Argentine, population 20,6 millions, possède 44,552 km de voies, tandis que la Grande-Bretagne, plus de deux fois la population a environ 75% de cette distance d'acheminement. La distance d'acheminement inéconomique ne constitue qu'un des nombreux problèmes ferroviaires argentins. Des nouvelles récentes de Buénos Aires indiquent que le gouvernement argentin s'inquiète de plus en plus au sujet des chemins de fer du pays. L'International Railway Journal a discuté la situation dans un interview exclusif avec le Dr. R. T. Aleman, Ministre de l'Economie dans le Gouvernement Argentin et ses réponses aux questions posées sont formulées dans cet article.

Argentiniens Streckenproblem

Argentinien hat bei 20.600.000 Einwohnern ein Eisenbahnnetz von 44.552 km. Grossbritannien dagegen, hat mit seiner mehr als doppelten Bevölkerung ungefähr 75% mehr Schienenkilometer. Diese unwirtschaftlichen Schienenkilometer sind jedoch nur eins der vielen Probleme, die die argentinische Eisenbahnverwaltung bedrängen. Jüngste Presseberichte melden zunehmende Sorgen der argentinischen Regierung hinsichtlich des nationalen Eisenbahnsystems. International Railway Journal hat die Lage in einem exklusiven Interview mit Dr. Roberto T. Alemann, Wirtschaftsminister der argentinischen Regierung, besprochen und seine Antworten sind in diesem Artikel aufgenommen.

La Argentina tiene problemas de vía

La Argentina—población de 20.600.000—tiene 44.552 km. de vías férreas, en tanto que la Gran Bretaña, cuya población es dos veces más grande, tiene aproximadamente 75% de este kilometraje. Pero el kilometraje poco económico de vías férreas no es el único problema con que la red argentina ha de enfrentarse. Recientes noticias recibidas de Buenos Aires indican que el gobierno de la Argentina está preocupándose más y más por la condición de la red nacional. La International Railway Journal ha discutido la situación en una entrevista exclusiva con el Sr. Dr. Roberto T. Alemann, el Ministro de Economía del Gobierno Argentino. Este artículo contiene sus respuestas a las preguntas hechas.

ILO looks at

Modernization on the Rails

Railway transportation has undergone profound changes in recent decades under the influence of two major forces: technological development and competition. These changes—and their effect on railway employees—were the topic of discussion at the Seventh Session of the Inland Transport Committee of the International Labor Organization at Geneva in May.

Among the most spectacular of these changes is the switch from steam to electric and diesel traction. The change has come so fast that the steam engine, which had dominated the scene until ten years ago in the great majority of countries, is now clearly on its way out. On 28 March 1960, the last regularly scheduled steam locomotive in the United States moved into retirement. The Swiss Railways also virtually completed, during 1960, the electrification of both main and secondary lines. In the Netherlands all important lines have been electrified since the war and diesel traction introduced on other lines.

In some other countries, a complete switch-over is the avowed aim of investment policy, and considerable progress has already been made toward this end. Thus, in the United Kingdom, the modernization plan provides for the complete elimination of steam traction, and the last steam engine for home use has been manufactured in that country. The 19,000 steam locomotives in service in 1954, many of which were distinctly over age, will be brought down to 7,000 by 1963, while 2,300 diesel main-line engines and 2,000 shunting engines will have been brought into service, as well as 4,000 diesel multi-unit trains which will improve passenger services, particularly on short-distance shuttle services. By 1961 almost all passenger services will be operated by diesel or electric power although some 10,700 steam locomotives will still be in service. In Belgium a complete changeover is also the aim, and a first stage of electrification, covering 900 kilometres of line, has already been completed.

The development of railway transport in the USSR at present is characterized by the thoroughgoing reconversion of traction power. In accordance with the Seven-Year Plan for the development of the national economy (1959–1965), between 85% and 87% of total freight traffic on the railways will be moved in 1965 by electric and diesel power. The general plan for electrification of railway transport adopted in 1956 provided for 40,000 kilometres of railway-line to be electrified in 15 years. The 1959 total length of electrified lines was 10,000 kilometres and the Seven-Year Plan now provides for the electrification of some 20,000 additional kilometres. In addition, during this seven-year period diesel traction is to be introduced on a total of 58,000 kilometres; as a result, the total length of lines served by this type of traction will reach 70,000 kilometres in 1965. Steam traction should be completely eliminated by 1970.

In many other countries the replacement of steam traction is already far advanced and is planned to be taken further. Thus in France, by the end of 1959, about 6,600 kilometres of main line had been electrified. Though these constitute about 17% of the total length of line in operation, they carry a little over half the traffic of the whole country. In addition, over a thousand diesel-powered railcars run over many secondary lines, diesels are widely used for shunting and the use of high-powered diesels is being tried on certain main lines. The number of steam locomotives in service had dropped from 8,850 on 1 June 1950 to 3,884 on 1 June 1960.

In Austria, steam traction has dropped since 1950 from 71% to 36% of kilometres traveled, while electric traction has increased from 25% to 49% and diesel traction from 4% to 15%. In Norway, diesel or electric traction is stated to have replaced steam on a major proportion of trains, and in Sweden the locomotive-kilometres worked under steam have dropped from about 22 million to 5 million in five years. In Canada, the example of the United States has been followed and both the railway systems of that country have turned to

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La Modernisation et les Cheminots

Le transport ferroviaire a subi de profonds changements ces dernières dizaines d'années sous l'influence des deux forces principales: le développement technique et la concurrence. Ces changements — et leur effet sur les cheminots — constituèrent le sujet des discussions à la Septième Assemblée du Comité du Transport Intérieur de l'Organisation Internationale du Travail à Genève au mois de mai. Dans ce rapport quelques uns des changements techniques les plus importants et leurs effets ont été considérés: le remplacement de la traction vapeur par le traction diesel; l'introduction de machines électroniques pour les données; l'effet sur le rendement du cheminot; les changements dans l'effectif du personnel; les augmentations des salaires; les heures de travail et les améliorations générales des avantages sociaux. Au préléminaire, l'O.I.T. avait faire une enquête dans 22 pays par ses correspondants. En outre des spécialistes ont visité cinq pays — la France, l'Allemagne, la Suisse, le Royaume Uni et les USA. Des réponses écrites sent parvenues de 17 pays: Australie, Autriche, Belgique, Chine (Taiwan), France, République Fédérale d'Allemagne, Inde, Italie, la Malaisie, les Pays-Bas, la Nouvelle Zélande, la Norvège, Pakistan, Suède, Suisse, Grande-Bretagne et Etats-Unis. Les tendances et les développements dans tous ces pays ont été pris en considération.

Eisenbahner im Rahmen der Modernisierung

Der Eisenbahntransport hat in den letzten Jahrzehnten grundlegende Änderungen erfahren, wobei zwei wichtige Faktoren eine Rolle spielen: technische Entwicklung und Konkurrenz. Diese Änderungen — und ihre Auswirkung auf die Eisenbahner — waren die Hauptthemen auf der siebten Tagung des Inländischen Transport-Ausschusses der Internationalen Arbeitsorganisation, die im Mai in Genf stattgefunden hat. In dem betreffenden Bericht wurden einige der wichtigsten Änderungen und ihre Auswirkungen besprochen: die Umschaltung von Dampf- auf Dieselbetrieb; die Einführung elektronischer Datenverarbeitungsgeräte; die Auswirkung auf die Leistung der Eisenbahner; zahlenmässige Änderungen der Personalsbesetzung; Erhöhung der Löhne und Gehälter; Arbeitszeit und allgemeine Verbesserungen hinsichtlich der Sozialfürsorge. Bei der Vorbereitung des Berichtes hielt die ILO über ihre Korrespondenten eine Umfrage in 22 Ländern. Ausserdem besuchten einige Vorstandsmitglieder fünf Länder, nämlich Frankreich, Deutschland, Grossbritannien, die USA und die Schweiz. Aus folgenden 17 Ländern gingen schriftliche Antworten ein: Australien, Österreich, Belgien, China (Taiwan), Frankreich, aus der Bundesrepublik Deutschland, Indien, Italien, Malakka, den Niederlanden, Neuseeland, Norwegen, Pakistan, Schweden, der Schweiz, Grossbritannien und aus den USA. Die Entwicklungsrichtungen in allen diesen Ländern wurden aufmerksam beobachtig.

Modernización y el Empleado Ferroviario

En los recientes décadas la trasportación ferroviaria ha experimentado unos profundos cambios bajo la influencia de dos factores importantes: el desarrollo tecnológico y la competencia. Se discutieron estos cambios y su influjo sobre los ferroviarios en la séptima sesión de la Comisión para el Transporte Interior de la International Labor Organisation en Ginebra en el mes de mayo pdo. En el informe se refiere de unos de los mayores cambios técnicos y sus efectos: la transición de la tracción a vapor a la tracción Diesel; la introducción de calculadoras electrónicas; el efecto en la producción de los ferroviarios; cambios en el número total del personal activo; aumentos de sueldos y salarios; horas laborables y mejoramientos en el servicio social. Para la redacción de este informe la ILO se dirigía a sus corresponsales en 22 países. Además, sus funcionarios visitaban a 5 países; Francia, Alemania, Suiza, el Reino Unido y los EE.UU. Se han recibido respuestas escritas de 17 países: Australia, Austria, Bélgica, China (Taiwan), Francia, República Federal de Alemania, India, Italia, Malaya, Países Bajos, Nueva Zelanda, Noruega, Pakistán, Suecia, Suiza, Reino Unido y los EE.UU. Se ha referido de las tendencias y los desarrolos en todos estos países.

ILO CONTINUED

diesel traction on a large scale, the change being carried through much more rapidly than it had been in the United States, so that steam traction will have been completely eliminated within the next few years. In Italy also, most of the main lines are electrified, a substantial proportion of the work having been carried out within the last ten years or so.

In another group of countries, a start is being made. For the German Federal Railway, for instance, a ten-year investment is being considered, within which certain major changes are to be carried out during the next four years. It is urged that about 5,000 kilometres of line should be electrified, of which 1,833 kilometres, including the main lines of the right bank of the Rhine and the Hamburg-Bavaria connection, should be completed within four years. If this program is carried out, 8,350 kilometres will have been electrified. It is also recommended that everything possible be done to facilitate the replacement of steam traction by diesel traction, especially for shunting and on secondary lines. Electrification is also being gradually carried out on the Polish railways.

In India, where steam traction is still the general rule, a further 100 main-line diesels have recently been acquired, particularly for the movement of coal and steel plant materials on the Eastern and South-Eastern Railways where traffic saturation has been about reached on steam operation. In Australia, the Commonwealth Railways have withdrawn all steam locomotives from regular operation on trans-continental and central Australian lines. In New South Wales, in 1958–59, 87 diesel engines provided 25% of all services and 31% of freight haulage; in Queensland, 58 diesel engines hauled one-third of the traffic, and 750 steam locomotives the remaining two-thirds. In Japan, all main lines are being electrified and diesel engines are replacing steam locomotives on secondary lines. In Malaya, diesel-electric engines are operating on the main lines for the principal passenger and freight services. Diesel railcars operate on certain trunk lines and for inter-urban passenger services. In Brazil, between 1956 and 1958, the proportion of steam drawn traffic dropped from 49% to 29%, while diesel drawn traffic increased from 28% to 48% and the percentage of electric drawn traffic remained stable at 23%. In 1951, on the Northern Region of the Chilean State Railways, steam engines covered a total distance of 3,470,000 kilometres (2,082,000 miles) as against 60,000 kilometres (36,000 miles) for diesel-electric engines; in 1956, the corresponding figures were 2,310,000

kilometres (1,386,000 miles) and 3,280,000 kilometres (1,968,000 miles) respectively. In Mexico, dieselization began in 1944; the changeover has been carried on steadily since then, and, by 1957, the National Railways operated a total of 337 diesel-electric locomotives.

Change on the railways has not only affected train operating, workshop, and maintenance-of-way practices but it has also had a considerable impact on administrative and clerical work in accounting, statistics, stores control, traffic control, certain engineering activities and research work.

In recent years electronic data processing machines have begun to prove their enormous potentialities in this field, and are revolutionizing the compilation and presentation of accounts and statistics. Such machines are not yet very widespread because they are expensive, and their installation and use require considerable advance study and preparatory work to determine the particular applications for which their cost will be economically justified; but more and more railway administrations are installing them.

A report of the International Railway Congress Association based on information received from the railways in 26 countries concluded that electronic data processing equipment appeared to be particularly suitable in connection with the control of staff and of supplies and materials, accounting, statistics, costing, budgetary control, control of the use of rolling-stock, study of fares and charges and certain technical and scientific calculations, related, for instance, to timetables.

The British Railways were the first in Western Europe to acquire a computer. It is used for working out the weekly pay slips for 11,000 employees in the Swindon railway works. The expected labour savings were in fact realized within a near margin, and there were fewer pay queries than with the old system. British Railways have subsequently acquired several other computers, with further machines on order or planned. These are being used largely on payroll work.

The French National Railways have recently put into operation an electronic computing centre built up around a 'Gamma-60' electronic computer, one of the most advanced types of high capacity computers. Until the changeover, accounting operations, payroll processing, traffic statistics, etc., were handled at six regional centres and six specialized offices in Paris. These 12 centres have now been replaced by the one computing centre, at Auteuil, near Paris, in association with 26 regional centres, each employing on an average six office-machine operators and a small group of other office personnel.

The Swedish Railways report having installed an automatic data processing computer of medium size (IBM 650) at their punch-card centre in 1959, which has facilitated routine work, such as the calculation and disbursement of salaries and pensions, the rendering of accounts, and statistics concerning passenger traffic and traction. The Belgian State Railways have also installed computers; the main one, set up in 1959, in the financial department. Another smaller electronic group automates much of the administrative work relating to the 14,000 items despatched every day in one of the Brussels goods stations. In the Netherlands, freight accounts and the working out of changes in wages and pensions are handled by electronic machines, but the mass of administrative work, including the establishment of payrolls and pensions, staff statistics, and passenger and goods traffic data, are still handled by Hollerith (punch-card) machines.

In the United States, large and intermediate scale computers have been in use by the railways for some years. In 1956, over 60% of the railway companies which replied to a questionnaire on the subject, reported that they were mechanizing or planning to mechanize their purchasing and stores procedures. A computer installed by the Southern Railway in Atlanta (Georgia) in January 1957 saved the Company $850,000 in clerical costs in the first year of operation and promised savings of up to $1,250,000 in another year. Another machine for payrolls installed on the Illinois Central turns out 100 pay sheets a minute for train staff, with all the necessary calculations based on time and mileage rates and social security and other deductions taken into account.

The Canadian National Railways have also installed a computer which, with its related equipment, can issue some 1,500 pay cheques an hour, which means that the entire Central Region payroll can be put out in about 40 hours. The machine, an IBM 650, works on a 20 hour-day basis, with a four hour period allowed for servicing.

In a recent report, the Canadian Pacific Railway indicated that, during 1959, "the integrated data processing program made steady progress, both in the mechanization of paperwork, with resulting economies, and in the development of refined information as a basis for managerial control and planning. In the autumn, a new and more powerful high speed electronic computer, the first of its kind to be delivered to any railway, was installed, and extensions to the system made possible by this new equipment

were commenced. The services provided include current information on train and car movements, car accounting, freight revenue accounting, operating statistics, dividend cheques and maintenance of shareholders' records, pay cheques, distribution of expenses, simulations of physical operations to assist in planning for optimum results, and special projects such as calculations required for analyses used in submissions to the Royal Commission of Transportation, which could not have been performed without the aid of high speed electronic computer equipment."

The technological advances, mentioned above, have necessarily had effect on railwaymen's output. The increase in labour productivity is reflected by the change in the average amount of traffic per railway employee. For instance in France, where extensive modernization has been taking place, the number of workers employed by the French National Railways (SNCF) which had been 514,000 in 1938 and 490,000 in 1946, dropped steadily to 362,000 in 1959, a reduction of no less than 30% since 1938. During the same period there was an increase of 43% in passenger transport and 99% in freight traffic. Thus, between 1946 and 1959, the increase in traffic units carried per railway employee amounted to 69%.

In Switzerland, where the main phase of modernization had already been carried through, employment on the railways increased by almost 5% in the 10-year period from 1949 to 1959; but in this same period, the total passenger and freight traffic carried, increased by over 42%; in consequence, traffic units

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handled per railway employee had increased by 37% in 10 years.

The overall study of productivity on European railways covering the networks of Austria, Belgium, Denmark, France, the Federal Republic of Germany, Italy, the Netherlands, Sweden and Switzerland, between 1950 and 1957, shows that the total number of man-hours worked by railway employees as a whole on these networks had fallen by 9%; during the same period, the traffic handled by these railways had greatly increased, and in consequence, traffic-units per man-hour rose from 75.2 to 106.5, or by 42%.

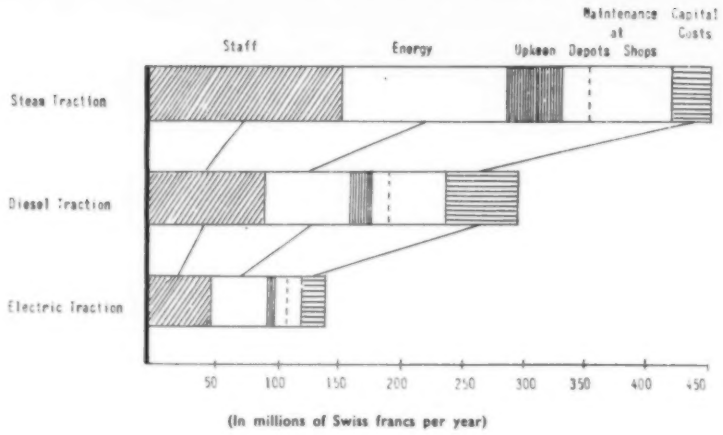
In the United States, where the railways have made considerable efforts to increase the efficiency of their operations and where many technological improvements have come into general use in the last 12 years, the number of railwaymen has steadily declined, with occasional minor fluctuations, since 1947, when they totalled 1,351,900. By 1959 the number of employees had fallen to 815,500, or by about 40%. In this same period, the number of man-hours worked by hourly-paid employees and train staff had been almost exactly halved, while freight and passenger traffic fell by about 17%. This means that the traffic carried per hourly-paid employee had increased by close on 40%.

In Great Britain, on the other hand, large-scale technical changes on the railways are only now beginning to make themselves felt, and competition from road transport has been intense. The number of railwaymen dropped from approximately 650,000 in 1948 to 519,000 in 1959, i.e., by about 21%—a reduction of 131,000 workers in 11 years; during this time, goods traffic declined by about 17% and passenger traffic showed a very slight increase. Thus, traffic units per railwaymen have increased by about 18% during this period.

In the two-year period from 1957 to 1959, 21,000 salaried and conciliation grade posts became redundant; of these redundancies, 41% could be attributed to reduced traffic levels, 18% to the effects of modernization, and 6% to the results of work study.

On the Belgian Railways, the number of railwaymen required per million traffic units carried dropped from 6.4 in 1938 (it was 6.0 in 1950) to 4.3 in 1960. In the Netherlands, the number of traffic units for each railwayman employed rose from 254,000 in 1950 to 316,000 in 1955 and to 330,000 in 1959. In Sweden, 214,000 traffic units were carried per railway employee in 1950, 254,000 in 1955, but only 242,000 in 1959.

Swiss Federal Traction Costs: 1960



In Japan, traffic units carried per worker employed rose from 187,600 in 1955 to 226,000 in 1959. In Malaya, the number of ton-miles performed for each railway worker increased from 16,300 in 1954 to 25,920 in 1959, and passenger-miles, from 24,730 to 28,370. In Pakistan (Eastern Bengal), the figures of passenger-miles and net ton-miles per railway employee show an increase of 1,200 and 1,480 respectively between 1958–59 and 1959–60. In New Zealand, from 1950 to 1960, the number of passenger train miles per employee rose from 206 to 241, while the number of gross ton miles per employee grew from 155,000 to 173,000. These are only a few examples of a general trend.

In some countries, major changes are still ahead, and it is of course difficult to forecast what their effect will be. However, in the Federal Republic of Germany—where various improvements in railway operations made between 1951 and 1957 had already led to an increase in productivity of 18%—a study of further ways of improving economy of operation on the German Federal Railway has been undertaken by a commission of inquiry, whose report has been submitted to Parliament. The report concludes that the technical improvements it recommends and a more rational organization should make possible, over a period of 10 years or so, a reduction in staff amounting to between 84,000 and 104,000 persons. These figures have been the object of criticism and may have to be corrected later, but they should be compared with a total employment of about 465,000 in 1958.

The general increase in the cost of living which has taken place in all parts of the world has given rise to demands by unions, for the maintenance of the purchasing power of their members and often for the adjustment of railway wages to bring them into line with those paid in other activities—and particularly in industry—as well. Claims of this kind have been put forward on every continent in the world. Many of them concerned the general level of wages. In countries in which the cost of living has been rising rapidly demands for wage increases have been put in year after year. During the last few years, for instance, such claims have been put forward in **Europe**, in France and Germany (Federal Republic) (1957, 1958, 1960), in Greece and Italy (1958 and 1960), in Norway and the United Kingdom (1957, 1958, 1959 and 1960; in **North America**, in Canada and the United States (1959 and 1960); in **South America**, in Uruquay (1958 and 1959); in **Africa**, in Kenya, Uganda and Tanganyika (1957, 1958, 1959 and 1960;) in **Asia**, in India and Japan (1957, 1959 and 1960).

It was specifically stated in the claims put forward that they were intended to adjust wages to changes in the cost of living (France, Germany, Greece, Italy, Norway and Kenya, for example) or to bring wages into line with those paid in industry in general in the countries concerned (examples are Italy and the United Kingdom).

In some countries, such as Germany and Switzerland, the employees of the private railway companies have demanded that their wages be adjusted to those of the employees of state railways.

Some of the claims put forward related to the fixing of a minimum wage or a minimum guaranteed wage; such claims were put forward, for example, by the Brotherhood of Locomotive Engineers in the United States, the National Federation of Indian Railwaymen and the Japanese National Railwaymen's Union.

In some cases demands were made for a

complete overhaul of the pay systems in use, in other words, the revision of the staff classification systems and the wage structure. This has been done in several countries in Europe (Belgium, Italy, France, Switzerland (partial revision) and the United Kingdom), Kenya in Africa, and India and other countries in Asia.

In India and Norway the railwaymen have demanded the establishment of a special body to examine wage claims and to settle disputes.

Certain claims have been put forward, independently of or in addition to claims concerning general wage levels, relating to particular aspects of the system of remuneration. For instance, a number of claims have been submitted concerning sliding-scale methods of adjusting wages to changes in the cost of living. For example, in Italy a claim has been put forward for the introduction of such a system. In the United States a number of railwaymen's organizations have demanded that the system be maintained; the non-operational staff have demanded that it be abolished; while the Brotherhood of Locomotive Engineers has demanded that adjustments be made on a quarterly instead of a half-yearly basis. Elsewhere, such as in India, Kenya and the United States (particularly by the Brotherhood of Railroad Trainmen), claims have been put forward concerning the introduction or application of cost-of-living allowance or for increases in those allowances; in the United States, too, a number of workers' organizations have asked for the incorporation of those allowances in basic wages.

In Italy the railwaymen have demanded the payment of a "14th month's wages" in addition to the "13th month" which has already been granted to them and an increase in family allowances; in Germany they have demanded the introduction of productivity bonuses.

Certain claims are concerned with grievances. For instance, in Tunisia protests have been made against the reduction of wages and family allowances; in British East Africa protests have been made against the slowness with which decisions concerning wage increases have been implemented; while in France the unions consider that the application of the wage increases which have been granted to them is spread over too long a period.

Demands for general reductions in the hours of work of railway personnel are being actively pressed in many countries. The demands usually concern the introduction of a working week varying between 40 and 48 hours, according to the regulations in force in the country concerned. It seems, from the statements made on the variety of different occasions, that the general objective is the gradual introduction of the 40-hour week for all railway workers. In France, for instance, the railwaymen have demanded a return to the statutory 40-hour week, while in Belgium they are demanding a five-day 40-hour week. In the United Kingdom the three main railwaymen's unions, whose members have been working a 44-hour week for some years, are still pressing for a reduction of weekly hours to 40. In Switzerland demands were recently put forward for a 44-hour week. In the Federal Republic of Germany, the German Federation of Trade Unions has demanded a reduction in the hours of work of the 30,000-odd railwaymen employed on standby duties from 60 to 54 hours per week. In Italy the railwaymen have demanded and obtained reductions in weekly working hours from 48 to 46 for others. In Greece railwaymen have for some years been demanding the introduction of the eight-hour day, which is not generally applied in the country, although—as they point out—the Greek Government has ratified the Hours of Work (Industry) Convention, adopted by the International Labour Conference in 1959, which is applicable, to railways. In Canada the railwaymen's unions have demanded "a substantial reduction in hours of work."

A number of demands have been put forward for the improvement of the provisions relating to annual holidays with pay. In Canada, for instance, 15 railwaymen's unions have put forward demands of this kind with a view to obtaining better holiday allowances. In the United States a demand has been made for an increase in the length of the holiday from seven to nine days, and 11 unions of non-operational employees have demanded increases in holiday allowances. Lastly, the French railwaymen's organizations have submitted claims concerning annual holidays with pay.

In France, Canada and other countries, railwaymen's organizations have demanded better welfare services and improvements in medical services and housing.

Changes In Active Staff Strength

COUNTRIES	1947	1953	1958	PERCENTAGE CHANGE 1947 = 100
AMERICA:				
Canadian Pacific . . .	65,400	74,441	70,817	+ 8.28
Canadian National . .	108,440	126,477	110,765	+ 2.14
United States	1,351,961	1,206,312	840,575	— 37.83
ASIA:				
India	1,046,843	931,308	1,108,525	+ 5.89
EUROPE:				
Austria	—	72,878	75,623	—
Belgium	91,698	72,404	67,968	— 25.88
Denmark	—	27,768	27,305	—
France	480,930	375,614	337,764	— 29.77
Germany (Fed. Rep.) .	448,328	468,291	465,658	+ 3.87
Italy	187,783	160,298	154,567	— 17.69
Netherlands	40,910	32,897	32,273	— 29.11
Norway	27,155	25,907	23,787	— 12.40
Portugal	—	26,909	25,645	—
Spain	119,899	140,136	130,202	+ 8.59
Sweden	59,886	67,420	63,367	+ 5.81
Switzerland (CFF) . .	37,700	36,186	38,662	+ 2.55
United Kingdom . . .	660,112	593,768	550,123	— 16.66

Feature of driver's equipment is that gears and brakes are regulated by foot pedals.
Compartiment du conducteur, commande de changement de vitesse et de freinage par pédales.
Bezeichnend für den Zugführerstand ist die Pedalbedienung des Getriebes und der Bremsen.
Instalación para el maquinista: manejo de frenos y cambio de velocidad por pedales.

Hamburg Tests the DT 2

"For the time being," says Hamburger Hochbahn AG, which operates the Hamburg underground, "fully automatic train operation without train personnel is not visualized."

But the company's actions in recent weeks would seem to indicate that it is giving a great deal more thought to train automation than the above statement implies.

• A group has been dispatched to study the underground systems in Leningrad and Kiev where the Russians have been conducting their own experiments with automation.

• Plans have been announced for the installation of electronic safety, brake and gear controls and a central train supervision point on the Hamburg underground.

• The new DT 2 trains now being tested by the company can be equipped for fully automatic external control.

Hamburger Hochbahn AG has already abolished train guards on all but one of its underground stretches and, with the introduction of closed circuit television, is in the process of reducing platform staff to one or two per platform. Its proposed installation of electronic controls would reduce the driver's duties to a minimum.

To implement its safety development program, HH has awarded a research grant to a German technical college to find a way of replacing the classical block system of signaling and track control by an electronically-based method. The goal is a continuous traffic control process enabling a train to follow that ahead at braking distance. Should the distance between trains become too short, the following train's brakes would be applied automatically. With the new signal system, which would make the usual color-signal method redundant, the driver would no longer have to pay attention to signals or trains running ahead of him. This would restrict his work to the starting of the train. The stopping of trains at platform points could be controlled electronically.

The overall control of the underground system would be taken over by the central supervision unit. Main task of this center, which HH hopes to construct without extra cabling, would be rapid elimination of operational holdups. As well as containing all operational control units, the center would have at its disposal a loudspeaker system by which passengers and staff in all areas could be informed of any traffic tie-ups.

Several electrical concerns are at present working on the problem of electronic control of gears and brakes. And an experimental train with electronic-hydraulic controls is reportedly undergoing trials in Hamburg.

Further, Hamburger Hochbahn's new DT 2 lightweight cars built by Linke-Hofmann-Bush of Salzgitter, which are now on trial, could, should the electronic control experiments succeed, be fitted with the necessary equipment.

Hamburger Hochbahn plans to purchase at least 100 of the new lightweight units should the trials of the DT 2 trains, which are scheduled to be completed this summer, prove successful.

The DT 2 trains feature exterior sheeting of light-weight stainless steel, use of synthetic materials to the greatest possible degree, and the use of bell-shaped rubber cushioning elements of progressive springing characteristics in the bogies and running gear. Of particular interest is the center articulation—the center "bogie" incorporates a semi-permanent special coupling without center pivoting; the two halves of the "bogie" can be easily disconnected. Thus the set—with a normal wheel arrangement of Bo-2-Bo—can be quickly subdivided for service or maintenance purposes into two individual cars with a wheel arrangement of Bo-1, overcoming one of the fundamental objections to articulated construction; the fact that if one half of the set requires maintenance the other half is automatically out of service. Electrical connections between the two sections are readily disconnected.

Car body shells are built of light-weight electrically-welded steel sections; the stainless-steel exterior sheeting, corrugated below the belt rail for added strength, is spot-welded to the framework. Framework is of grade St. 37 and grade St. 52 steel, while the sheeting is stainless special steel X 12 Cr Ni 188. The central part of the roof is made of fiberglass-reinforced polyester material. The body is designed to withstand static pressure of 100 tons at anti-climber level and 50 tons at the couplers. Flooring consists of corrugated steel sheet, anti-drumming insulation, mats of insulating material and rock wool, and "Multiplex" plywood plates covered with 2.5-mm polyvinyl chloride (PVC) flooring material. Additional insulation of the car body is provided by a 2-mm layer of anti-drumming insulation applied to the inside of the exterior sheeting, and rock-wool or sprayed-cork insulation material in the wall space of the body sides.

Interior panelling up to belt-rail level consists of 2.5-mm plastic panels; window sill frames and wall pillars are covered with fiberglass-polyester material, and covering mouldings are of PVC fastened without screws. Toughened safety-glass windows of the fixed type are held by special BVC glazing profiles in the window frames; each car body has four semi-automatic pneumatically-operated sliding doors of light metal, each with two leaves. The door-operating mechanism is equipped with an independent air compressor.

Each car body seats 41 passengers in

Experimental DT 2, claimed to be first underground wagon without compressed air braking.
DT expérimentale, la première voiture de métro sans freinage à air comprimé.
Versuchswagen DT 2 kann sich rühmen, der erste U-Bahnwagen ohne Luftdruckbremse zu sein.
DT 2 experimental, según dicen el primer vagón metropolitano sin frenos neumáticos.

anatomically shaped polyester-fiberglass seats; standee capacity is 178 passengers for the two-car train and the 39-ton tare weight of the set gives a tare-to-payload ratio of approximately 2:1—150 kg of dead weight per passenger.

Illumination is provided by two continuous strips of flourescent lighting, with four emergency lights; the hot-air heating system utilizes waste heat from the traction motors, through an electronically-controlled heating system that takes in fresh air from above floor level through a central filter system and distributes hot air through channels and distribution boxes under the seats. Each car body is equipped with 10 static roof ventilators and air chambers. Entry sections are provided with handrails of seamless tubular steel faced with PVC material, and light metal luggage racks of anodized finish are provided on the end walls of the passenger saloon.

Electrical equipment consists of four DC traction motors, one for each axle of the end bogies, type BG 56 cmh, with an output of 80 kw each at 1250 rpm and 100% self-excitation. Motors are connected in series, working on a third-rail voltage of 750 v, and are of hollow-shaft armature construction, driving through torsion shafts, multiple-disk clutch couplings and hollow-shaft gearing with a ratio of 1:6.93. Control is through two pedals in each of the two drivers' cabs, the right-hand pedal for brake and deadman control and the left operating the main controller. The set is fitted with fully-automatic electromagnetic contactor controllers; control voltage is 110 volts through fully-automatic drum switches. Two acceleration steps are available for running, and a weight-control device provides constant acceleration and deceleration independent of car weight.

First service braking is accomplished by electric short-circuit braking of the motors and electric solenoid brakes on the unpowered intermediate running gear; the controls provide three selectable deceleration stages, and 22 brake steps, each of which can be kept in function at the driver's discretion. Second service brake for the motor bogies is provided by a spring-actuated solenoid brake and parking brake by a spring brake; second service and parking brakes are of the disc type. Emergency braking is accomplished by spring brakes in combination with short-circuit braking.

Sets are equipped with the fully-automatic multiple-unit center buffer couplers and draw gear of the associated Scharfenberg firm. Draw gear incorporates hydraulic shock absorbers with integral destruction members designed for 50-ton impact.

The twin-car set measures 27,480 mm overall, 2500 mm in width over exterior sheeting and 3335-mm rail to roof; floors are 1040 mm above railhead level. Motor bogies have 860-mm wheels and a wheelbase of 2100 mm. The intermediate running gear has wheels of the same size and a 2400-mm wheelbase, and the distance between center pivots of the motor bogies and the pivots of the intermediate running gear is 8000 mm. Maximum speed for the two-car train is 70 km/h.

Le Métro de Hambourg

La Hamburger Hochbahn AG, qui exploite le métro de Hambourg, dénie d'envisager le fonctionnement entièrement automatique des trains sans personnel. Toutefois des décisions récentes indiquent que la compagnie considère sérieusement l'automatisation des trains. Une délégation étudie les métros de Léningrad et Kiev où les russes ont fait des essais d'automatisation. On a annoncé des plans pour le placement de systèmes électroniques de sûreté, de freinage et d'engrenages au métro de Hambourg. Le nouveau train léger DT 2 en essai à la Hamburger Hochbahn a été conçu pour permettre à distance sa commande entièrement automatique.

Hamburger U-Bahn

Die Hamburger Hochbahn AG, die auch die Hamburger U-Bahn betrieb, dementiert, dass vollautomatischer Personenverkehr vorgesehen sei. Anderseits lässt die Art ihrer Aktivitäten vermuten, dass sie sich eingehend mit der Zugautomation beschäftigt. Einige ihrer Leute sind in Moskau und Leningrad, um Studien über die dortigen U-Bahnsysteme zu machen, an denen die Russen Automationsversuche machen. Pläne wurden veröffentlicht über elektronische Sicherheits-, Brems- und Antriebbedienung bei der Hamburger U-Bahn. Und die jetzt von der Hamburger Hochbahn erprobten Leichtzüge, Baureihe DT2, sind so konstruiert, dass sie auch mit vollautomatischer Fernsteuerung verwendet werden könnten.

El metropolitano de Hamburgo

La Hamburger Hochbahn AG, que explota el metropolitano de Hamburgo, desmiente que aspire a operar sus trenes enteramente automáticamente. Pero decisiones recientes indican que la compañia considera en serio la automación. Un grupo está estudiando las redes subterráneas de Leningrad y Kiev, en donde los rusos han experimentado con la automación. Se han anunciado proyectos para la instalación de mandos electrónicos de protección, de freno, etc. Y la construcción de los trenes, ligeros DT 2 permite la instalación del mando externo automático.

Germany-Italy-Japan:

New Concepts I

Toshiba locomotive is suitable for low speed shunting.
Locomotive de manoeuvres vitesse réduite Toshiba.
Die Toshiba-Lok eignet sich für Langsambetrieb.
Locomotora Toshiba es apta para maniobras a baja velocidad.

Badoni rod-driven VII-B shunter handles 1100 tons at 4 km/h.
Locomotive de manoeuvres Badoni VII-B, à bielle, 1100 t. à 4 km/h.
Badoni Rangierlok VII-B mit Stangenantrieb—1100 t bei 4 km/h.
Maquina Badoni VII-B accionada por biela: maneja 1100 ton. a 4 km/H.

L-H-B 600-hp shunter has 15 possible wheel arrangements.
Locomotive de manoeuvres L-H-B 600 CV, 15 dispositions des essieux.
LHB 600 PS-Rangierlok hat 15 Achsenanordnungsmöglichkeiten.
Maquina de maniobras L-H-B 600 HP con 15 posibilidades de dispocion de los ejes.

The relative merits of the electric and hydrodynamic transmissions for diesel locomotives are still the subject of intense discussion in the railway world (see "The Diesel Debate," IRJ, Oct., 1960, p. 68). Meanwhile, industrial shunting locomotives introduced by Japan's Tokyo Shibaura Electric Co. and Italy's Antonio Badoni are focussing attention on a transmission which appears to combine the advantages of both with a particular suitability to low-speed shunting service. At the same time, a new diesel-hydraulic shunter, recently introduced by Linke-Hofmann-Bush of West Germany, employing four complete engine-transmissions sets—each independently driving a single axle—presents another factor for diesel experts to consider in the unending diesel debate.

The hydrodynamic transmission, following the basic designs of Fottinger, uses the dynamic movement of fluid between closely spaced components of torque converters and fluid couplings as a means of transmitting and modifying torque. In other respects, the flow of power from the prime mover to the wheel is accomplished by mechanical means—cardan shafts, rods, or (in low horsepower units) chains. The Hydro-Titan transmission, developed by Switzerland's Louis de Roll Iron Works, and used in both the Badoni and Toshiba locomotives, uses oil as a medium of power transmission, but in many respects it is more closely analogous to the electric drive.

A swash-plate plunger pump ("generator") driven by the diesel prime mover supplies oil under high pressure to one or more swash-plate oil motors; pressure in the propulsion circuit is controlled by varying the swash-plate angle of the main pump. If desired the plate angle of the driven oil motor can be servo-controlled to respond automatically to the pressure of oil in the transmission circuit. So controlled, the angle is automatically reduced as pressure drops, reducing

In Shunters

torque and increasing speed as the resistence of the train is lowered. In both the Toshiba and Badoni units a single hand-wheel serves to control the hydraulic system. In addition to the simplicity of operation, the hydrostatic transmission, since it requires no mechanical connection between its various components as does the hydrodynamic drive, permits their placement wherever dictated by design convenience—an advantage often cited in favor of the electric transmission as well.

In the Toshiba shunter—a 25-ton unit first shown in October 1960, at the Second Asian Railway Conference in Tokyo and the firm's first complete locomotive—the analogy with the electric transmission has been carried to the point of using individual oil traction motors, one for each of the two axles, mounted and geared in much the same fashion as the familiar electric traction motor.

A DMH 17C 1500-rpm diesel engine (Japanese National Railways standard) rated at 180 hp drives a Hydro-Titan swash-plate plunger type oil pump with a rated output of 160 hp and a swash-plate angle variable from 0° through 25°. The main propulsion hydraulic circuit has a maximum pressure, under starting load, of 250 kg/cm², and a normal rated pressure of 109 kg/cm². The two oil motors have a 350 m-kg maximum starting torque and a normal rated operating torque of 154 m-kg; swash-plate angle is controlled by servo motors from 25° at maximum torque to a minimum of 5°. Motors are geared to the axles at a ratio of 4.5 to 1. The shunter has a maximum tractive effort of 7500 kg and a top speed of 52 km/h.

While the hydrostatic-drive shunter shown at Tokyo is the first complete locomotive to be built by Toshiba, Antonio Badoni of Lecco, Italy, has been building diesel tractors and locomotives for nearly thirty years. Several years ago Badoni began using the Hydro-Titan

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Nouvelles Conceptions pour Locomotives de Manoeuvres

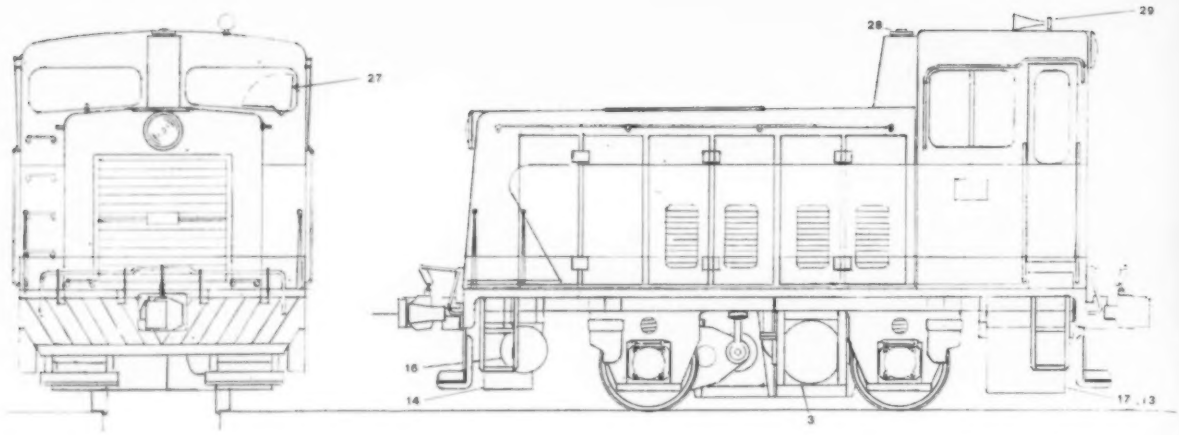
Les mérites relatifs des transmissions électriques et hydrauliques pour locomotives diesel constituent toujours le sujet de discussions intenses dans le monde ferroviaire (voir "The Diesel Debate," International Railway Journal, octobre 1960, p. 68). Entretemps les locomotives de manoeuvres industrielles introduites par la Cie. Electrique Shibaura, à Tokio, et Antonio Badoni en Italie, attirent l'attention sur une transmission hydrostatique, qui semble combiner les avantages aussi bien de la transmission hydrodynamique qu'électrique, avec une capacité particulière pour le service de manoeuvres à vitesse réduite. L'avantages principal de la transmission hydrostatique paraît être la simplicité des commandes. La locomotive japonaise Toshiba et l'italienne Badoni ont toutes les deux trois commandes de base: marche avant et arrière; frein à air comprimé; roue ou obturateur de commande de pression. Contrairement aux transmissions hydrodynamiques ou électriques, la transmission hydrostatique atteint son rendement maximum tout en bas de la gamme de vitesse, ce qui la rend idéale pour les locomotives de manoeuvres ou d'autres éléments qui doivent fournir un maximum de force à vitesses réduites. D'autre part, une nouvelle locomotive de manoeuvres allemande Linke-Hofmann-Bush, à quatre transmissions-moteur, chacune actionnant un seul essieu, offre un autre sujet pour la discussion diesel.

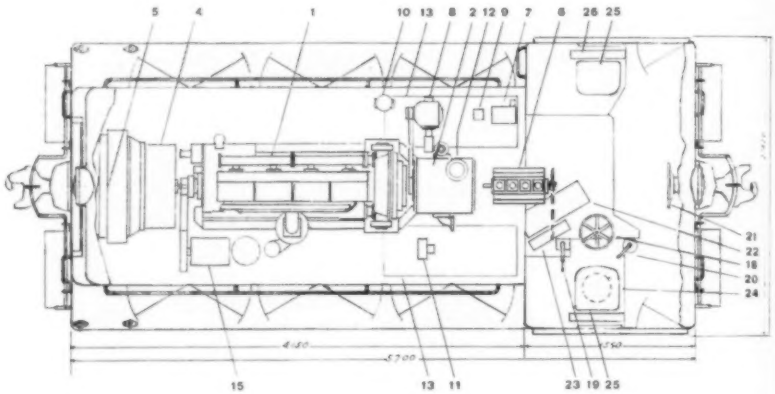
Auch Rangierloks sind zeitgemäss

Die beziehungsweisen Vorzüge elektrischer und hydrodynamischer Transmissionen für Dieselloks sind noch immer Gegenstand eifriger Diskussionen in der Eisenbahnwelt (s. "Diesel-Debate," International Railway Journal, Oktober 1960, S. 68). Inzwischen lenken die in Japan, Tokyo Shibaura Electric Co., und in Italien, Antonio Badoni, eingeführten Rangierloks für Industriebetriebe, die Aufmerksamkeit auf die Vorzüge der hydrostatischen Transmission, die die Vorteille hydrodynamischer und elektrischer Kraftübertragung mit einer besonderen Fähigkeit für den langsamen Rangierbetrieb zu kombinieren scheint. Der grösste Vorteil der hydrostatischen Transmission scheint ihre einfache Bedienung zu sein. Sowohl die japanischen Toshiba-Loks wie die italienischen Badoni-Loks haben nur drei Grundbedienungen: vorwärts und rückwärts; Luftdruckbremse; Drucksperrscheibe oder Drosselventil. Anders als die hydromatische oder elektrische Transmission, erreicht der hydrostatische Antrieb auch am Ende seiner Geschwindigkeitsskala maximale Leistungen. Diese Eigenschaft ist ideal für Rangierloks oder andere Einheiten von denen im langsamen Verkehr höchste Kraft verlangt wird. Die neue dieselhydraulische Rangierlok von Linke-Hofmann-Bush, Salzgitter-Watenstedt, mit vier vollständigen Kraftübertragungsvorrichtungen—jede als unabhängiger Wellenantrieb—wird den Dieselsachverständigen Gelegenheit geben, in der nicht endenden Diesel-Debatte einen neuen Faktor berücksichtigen zu können.

Nuevas ideas en locomotoras de maniobras.

Se discuten todavía en los círculos ferroviarios las ventajas respectivas de las transmisiones eléctrica e hidrodinámica para locomotoras diesel (véase "The Diesel Debate", International Railway Journal, octubre 1960, página 68). Parece que la transmisión hidrostática de las locomotoras industriales de maniobras introducidas por la Tokyo Shibaura Electric Co. de Japon y la Casa Antonio Badoni de Italia combina las ventajas de las transmisiones hidrodinámica y eléctrica, particularmente en el servicio de maniobras a baja velocidad. Tanto la locomotora japonesa de Toshiba como la de Badoni de Italia no tienen más que tres mandos básicos: adelante y marcha atrás; freno de aire; regulador de presión. A diferencia de las transmisiones hidromática y eléctrica el dispositivo hidrostático alcanza su mayor eficacia a baja velocidad, lo que es muy conveniente para locomotoras de maniobras u otras unidades que han de operar a baja velocidad. Al mismo tiempo una nueva locomotora diesel-hidráulica de maniobras introducida por Linke-Hofmann-Bush de Alemania occidental y que emplea cuatro juegos completos de transmisión—cada uno moviendo uno de los ejes—constituye otro factor para los expertos en el debate sin fin sobre asuntos diesel.





Toshiba Shunter

1. Diesel engine
2. Oil pump
4. Oil motor
3. Radiator
5. Oil cooler
6. Block valve
7. Safety valve
8. Oil pump for control
9. Automatic controlling valve
10. Magentic filter
11. Supply valve .
12. Servo motor with oil pump
13. Oil tank for action
14. Fuel tank
15. Air compressor
16. Air resevoir
17. Battery
18. Driving handle
19. Handle for engine starter
20. Air brake handle
21. Handle for hand brake
22. Gauge board
23. Button switch
24. Warmer
25. Seat
26. Arm rest
27. Wiper for window
28. Exhaust pipe of engine
29. Whistle

Toshiba operating controls are simple
Permanence exploitation Toshiba simple
Die Bedienung der Toshiba ist einfach
Sencillos mandos de operacion Toshiba.

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drive, and the range of "ABL" hydrostatic shunters now ranges from 35 hp midget tractors to 350-hp three-axle shunters for the Italian State Railways.

The flexibility of the hydrostatic drive, so far as placement of components is concerned, is clear from the difference in the arrangements of the Toshiba and Badoni units. While Toshiba has placed components much as in an electric-transmission diesel, Badoni's locomotives follow the pattern familiar in mechanical and hydrodynamic-drive diesels: engine, pump and a single hydraulic motor are closely grouped under the hood; drive is through jackshaft and rods in the larger units, or through chains in the smaller shunters and tractors.

Considerable attention was attracted at the 39th Milan Trade Fair this April by Badoni's VI°/203 chain-drive industrial shunter. The 22-ton two-axle unit uses a Fiat type 203 diesel engine with automatic speed control and an output of 140 hp at 1800 rpm. Unlike the Toshiba shunter and larger Badoni units, the swash-plate angle of the oil motor is fixed for maximum inclination and torque, control being solely through the angle of the pump swash-plate. The two axles are driven by chains from a central jackshaft driven by the oil motor. Length of the shunter is 6.28 meters; height is 3.05 m and width 2.8 m; wheelbase two meters. Maximum tractive effort is 6000 kg. The locomotive will handle 850 tons in train on straight and level track at four km/h, 200 tons at maximum speed of 20 km/h, and 130 tons at four km/h on a 3 % gradient.

Most recent addition to the ABL line is the rod-driven VII-B shunter. Powered by an OM CH2DL diesel, the 230-hp 28-ton unit has a maximum speed of 25 km/h and will handle 1100 tons straight-and-level at four km/h and 260 tons at top speed. On the level, maximum starting tonnage is 1350. The 9300-kg maximum tractive effort will take a 300-

DMH 17C 1500 rpm diesel engine rated at 180-hp powers Toshiba.
Moteur diesel DMH 17C 1500 tours minute 180 CV de la Toshiba.
Toshiba-Antrieb ist ein 180 PS-Dieselmotor DMH 17C, Drehzahl 1500.
Motor Diesel DMH 17C 180 HP nominal acciona maquina Toshiba.

Mounting of traction motor is similar to diesel electric
Montage du moteur de traction similaire au diesel électrique.
Zug- und dieselelektrischer Motor werden in gleicher Weise montiert.
El montaje del motor de traccion es igual al del dieselelectrico.

ton trailing load up a 2% grade at 4 km/h, and the two-axle shunter will negotiate a curve of 50 meters minimum radius. The vertical-shaft oil motor, with variable swash-plate angle drives through a jackshaft under the shunter's nose and through side rods to the axles.

Chief advantages of the hydrostatic transmission appear to be its simplicity of operation—both Toshiba and Badoni locomotives have only three basic controls: forward and reverse; air brake; and pressure control wheel or throttle—and its performance curve. Unlike either hydrodynamic or electric transmissions, the hydrostatic drive reaches maximum efficiency at the bottom of its speed range. This is ideally suited for shunting locomotives or other units required to deliver maximum power at low speeds. Badoni, for example, calculates that the efficiency of the hydrostatic drive used in its locomotives reaches 50% at approximately 3% of maximum speed, with a peak efficiency of about 93% at 22% of top speed. Comparative curves from the same calculations show peak efficiencies of about 85% at 72% and 98% of top speed for a three-range hydrodynamic drive and 75% efficiency at 59% of maximum velocity for electric transmission.

The hydrostatic transmission also enjoys two other advantages over the standard hydrodynamic drive: the power curve is smooth as compared with a two or three-stage drive, and the nature of the drive allows a design flexibility in the placement of components. Units now in use are rigid-frame locomotives; whether the flexibility of layout would extend to the use of electric-style, bogie-mounted oil traction motors would seem to be a problem of suitable flexible connections for the high-pressure hydraulic circuits.

An innocuous-appearing blue diesel-hydraulic shunter recently completed by Linke-Hofmann-Bush of Salzgitter-Watenstedt, West Germany, for the Salzgitter Verkehrsbetrieb and shown at the German Industries Fair in Hannover, threatens to throw the most sophisticated system of axle notation into complete confusion. The purist who insists on strict separation of powered and carrying axles will find himself dealing with a locomotive that—chameleon-like—keeps changing its wheel arrangement, with only the driver aware at any given moment which of the 15 possible combinations is in use.

Behind this apparent confusion is an attempt to obtain maximum flexibility, longer engine and transmission life, and minimum operating and maintenance costs.

Even when the wheel arrangement is agreed on, for convenience, as Bo-Bo, a difference from the conventional diesel-hydraulic locomotive is immediately evident—the lack of coupled axles. The basic novelty of the locomotive is that it employs four complete engine-transmission sets, each independently driving a single axle. The changeable wheel arrangement is accounted for by the fact that—depending on service requirements—from one to four engines (and axles) may be used.

The basic reasoning underlying the design is threefold:

• Under the widely various conditions found in local shunting and transfer service, a locomotive following conventional design that is adequate for the maximum desired load is frequently uneconomically employed either in running light or in handling loads requiring less than full horsepower. Maximum operating economy is therefore achieved if the power output of the locomotive can be controlled at the prime mover—the diesel engine.

Since a conventional diesel engine operates at maximum thermal efficiency only within a relatively narrow speed and horsepower range, the most efficient way to vary the power input and fuel consumption is with more than one engine, each engine operating within its efficient range but employed only as needed to meet load conditions. Thus, the LHB locomotive is, in effect, a 150, 300, 450 or 600-hp unit as required.

• Provided maximum use is made of adhesion weight for each axle, adhesion weight should be in proportion to available horsepower. It is not necessary, or even desirable, that axles be coupled, since with individual-axle drive the adhesion weight and tractive effort are automatically scaled to the number of engines operating, and thus to available horsepower.

• Diesel engines in the 150-hp range are widely used—for example, in road-vehicle and industrial applications—and produced in large series; much the same is true of hydrodynamic transmissions. In addition to providing greater operating and fuel-consumption flexibility, the four-engine design permits the use of engines and transmissions whose volume production not only contributes to lower first cost but assures the ready and moderately-priced availability of replacement parts.

Certain questions immediately arise. Perhaps the most obvious stems from the fact that the locomotive employs four complete sets of diesel engine, transmission and drive shafting: doesn't this multiplication of components result in increased opportunity for failure and consequent higher maintenance costs?

The locomotive's designer maintains, in answer to this question, that since individual engines are not operating all the time that the locomotive is in service, their useful life is extended and opportunity for failure reduced. Engine and transmission makers, according to LHB, claim a useful life of approximately 35,000 operating hours for their products, whether large or small, before replacement is necessary. If the power package is

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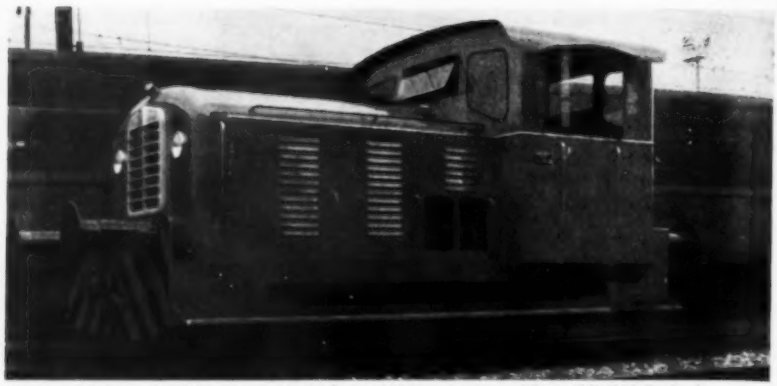
Badoni has only three basic controls.
Badoni n'a que trois commandes principales.
Die Badoni-Lok hat nur drei Hauptsteuerungen.
Maquina Badoni tiene tres mandos basicos.



Fiat, type 203 engine with output of 140 hp at 1800-rpm powers 22 ton VI°/203 Badoni.
Moteur Fiat type 203 de 140 CV à 1800 tours minute de la Badoni 22 t. VI°/203.
Die Badoni-Lok, 22 t—VI./203—hat einen 140 PS Fiat-Motor 203, Drehzahl 1800.
Motor Fiat tipo 203 140 HP 1800 rpm acciona la Badoni 22 toneladas, VIe/203.

Maximum economy is claimed for LHB shunter.
Locomotive LHB économique.
Die LHB-Rangierlok ist sehr wirtschaftlich.
Locomotora economica LHB

used only a part of the time, the useful life of the locomotive will be increased even though the actual operating life of the components remains unchanged. Any complications arising from the multiplication of parts, the builder claims, will in any case be more than offset by lower maintenance and replacement costs resulting from the use of mass-produced components. An additional claim for the locomotive, maintenance-wise, is that in the case of a diesel-engine failure the locomotive is still operable at 75% of total capacity.

Another question arises from the lack of coupled axles—a characteristic that is often cited as an advantage of conventional diesel-hydraulic locomotives. Coupling of axles is claimed to produce more efficient use of adhesion weight and to virtually eliminate wheel-slip. The builders maintain that the first problem is negligible in locomotives designed for the type of service in question; the rapid drop in torque characteristic of a hydraulic transmission when the speed of the driven portion increases rapidly serves as an automatic preventative for wheel-slip.

The concept of individual axle drive in a diesel-hydraulic locomotive has already been used by LHB in its two-axle S 400 shunter, a center-cab unit employing two Daimler-Benz 648a engines developing 225 hp at 1500 rpm and driving through individual EMG hydro-mechanical transmissions. A number of S 400 units have been built and experience with the smaller unit has been used in the design of the bogie shunter.

The larger unit is also of center-cab design. The four engines, each with a rated horsepower of 164 and an input to the transmission of 150 hp (allowing for auxiliaries), are mounted side by side on individual rubber-mounted anti-vibration carrying frames, two under each equipment hood. Each engine drives, through a torsionally elastic coupling, an EMG hydro-mechanical transmission. The transmission consists of a torque converter followed by three gear-change stages with automatic shifting and a fourth stage consisting of a direct, "straight-through" connection. Drive to the axles is through cardan shafts and bevel gears of conventional design.

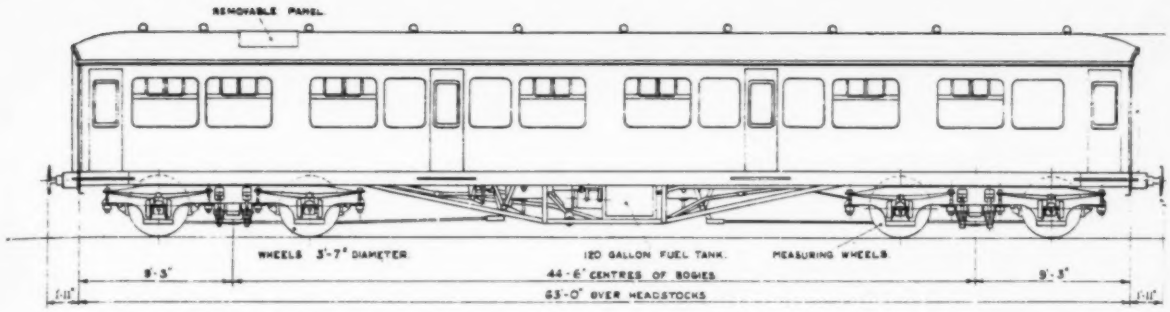
New, in the 600-hp unit, is the automatic engine control developed by LHB. Experience with the 400-hp unit—in which the use of one or two engines was determined by the driver—showed that drivers had a strong tendency to operate the locomotive under all conditions with both engines, cancelling any gains in fuel efficiency.

In the 600-hp unit the driver is provided with a full set of controls for each engine. "Nerve center" for the locomotive, however, is a special automatic unit that takes control of the engines out of the driver's hands in normal operation.

A small panel in the center of the driver's dashboard contains the automatic unit's controls. A main control knob with three positions permits "run light" operation on a single engine, independent control of the engines by the driver (normally used only in the event of malfunction or in special circumstances), or full automatic working. For automatic operation, the driver preselects a desired operating speed by operating a multi-position switch on the panel. Unlike the Rolls-Royce "Taurus" shunter, which has two engines (IRJ, May, p. 16), the LHB locomotive employs all engines for maximum starting tractive effort. Once the preselected speed is reached the automatic unit cuts out one engine; if the speed continues to increase, a second engine is cut out, and so on.

While the cutting-out of individual engines is automatic, the reverse is not true. If the locomotive, operating at the preselected speed on less than four engines, encounters a grade or other conditions that cause the speed to drop, the driver is provided with an "override" button on the automatic unit's control panel. By pressing the button the driver can bring into play an additional engine. The automatic unit, however, will ignore the instruction if the override is not warranted. If the locomotive is operating on less than three engines and the speed continues to drop, the override button may be used again to bring still another engine into operation. A recording unit keeps track of the control's movements, permitting close monitoring of the driver's performance.

An equal distribution of work between the four engines is assured by the automatic unit, which cuts engines in or out in a revolving sequence calculated to divide the actual working time of the engines so that no single engine is used more intensively than another—an important factor in prolonging the locomotive's operating life and reducing maintenance costs.



New Dynamometer Car for BR

A new dynamometer car has been built for the Western Region of British Railways. It is the result of several years' study by the chief mechanical and electrical engineer of the region and is designed with the following requirements in mind:

- **To provide recordings for the application of the controlled road testing system.**
- **To provide for investigation of problems connected with the internal working of diesel and electric locomotives, and general problems such as adhesion, braking, stressing of parts, vehicle riding, etc.**
- **To provide for the widest application of modern potentiometric and electronic instrumentation.**
- **To provide, as far as possible under mobile conditions, laboratory facilities for all the above.**

On investigation it was found that the first requirement could be met by potentiometric and electronic equipment more conveniently and cheaper than by the usual hydraulic dynamometer of continental manufacture.

It was therefore decided to adopt potentiometric and electronic methods generally for all main testing requirements.

The new car is a conversion from a 19.2024-m corridor coach built in 1947. It has an underframe of the four truss type and is carried on light pressed steel bogies. The design has 3.352-m drawbars articulated at the bogie underframe bolster. In the conversion, the normal drawhooks and couplings have been replaced by stronger continental patterns, making the car "double ended" for testing purposes.

CONTINUED

Sensing elements for measuring drawbar forces, shown in stowed position.
Eléments observateurs pour mesurer les forces au crochet, position arrimée.
Tastelemente für die Messung der Kupplungsstangenleistung im Ruhestand.
Elementos para medir fuerzas de barras de tracción en posición cargada.

Les Chemins de Fer Britanniques Construisent Une Nouvelle Voiture Dynamomètre

Une nouvelle voiture dynamomètre a été construite pour la région occidentale des British Railways. Elle est le résultat d'une analyse approfondie des exigences actuelles et futures pour les essais sur la voie de tous les types de locomotives et de matériel roulant et a été construite d'après les plans de M. R.A. Smeddle, ingénieur en chef mécanique et de l'electrecite. On a prévu l'application du système d'essai contrôlé, dans lequel toutes les caractéristiques de traction et de résistance habituelles sont obtenues avec le train roulant aux vitesses variables d'utilisation normale. Pour effectuer le vaste programme d'essais pour laquelle elle a été désignée, la voiture est pourvue d'instruments potentiométriques et électroniques des plus modernes, en un mot un laboratoire mobile. La voiture en question est une voiture à couloir construite en 1947, pourvue d'un chassis du type à quatre fermes, reposant sur des bogies légers en tôle emboutie. Dans la transformation les crochets de traction normaux ont été remplacés par des modèles Continental plus solides. Les essais peuvent s'effectuer à chaque bout de la voiture. Un alternateur diesel a été installé pour fournir une source de force électrique indépendante pour les instruments électroniques, potentio-métriques et autres, pour l'éclairage l'eau chaude et les besoins du système de chauffage indépendant.

Neuartiger Dynamometerwagen bei der britischen Eisenbahn

Im Westbezirk der britischen Eisenbahn wurde ein neuartiger Dynamometerwagen in Betrieb gestellt. Er ist das Ergebnis ausführlicher Untersuchungen über die Forderungen, die heute und künftig an die Streckenprüfungen von Lokomotiven und Rollmaterial gestellt werden müssen; er wurde nach dem Entwurf des Herrn R. A. Smeddle, Bau- und Elektro-Oberingenieur des Westbezirkes gebaut. Zwecks grösster Nutzleistung enthält dieses Prüfsystem alle üblichen Betriebs- und Widerstands-Charakteristiken des normalen Streckenbetriebes bei verschiedenen Geschwindigkeiten. Damit der Wagen den hohen Anforderungen, die der umfangreiche Prüfbereich an ihn stellen wird, gewachsen ist, wurde er mit den modernsten potentiometrischen und elektronischen Geräten ausgerüstet—er ist mehr oder weniger ein mobiles Laboratorium. Für dieses Prüfmodell wurde ein 19,20 m langer Wagen mit Seitengang, Jahrgang 1947, umgebaut; er hat einen vierfächigen Tragrahmen, der auf gepressten Leichtstahl-Drehgestellen ruht. Bei dem Umbau wurden die normalen Zughaken und Kupplungen durch stärkere Continental-Muster ersetzt, so dass die Prüfung in beiden Richtungen vorgenommen werden kann. Ein dieselgetriebener Wechselstromerzeuger liefert Strom für die Bedienung der elektronischen, potentiometrischen und anderen Geräte, sowie für Beleuchtung, warmes Wasser und das unabhängige Heizungssystem.

Los Ferrocarriles Británicos están construyendo un nuevo coche dinamométrico

Se ha construído un nuevo coche dinamométrico para la Región Occidental de los Ferrocarriles Británicos. Es el resultado de un análisis profundo de cuanto los ensayos de vía de cualquier tipo de locomotora y material rodante necesitan. Ha sido diseñado el coche por el Señor R. A. Smeddle, ingeniero jefe electro-técnico y mecánico de la Región Occidental. El coche está equipado para la aplicación del sistema que permite obtener todas las características usuales de tracción y de resistencia al correr el tren a las diferentes velocidades de la operación normal. Contiene los instrumentos potentiométricos y electrónicos más modernos y es, de hecho, un laboratorio movible. El vehículo es un coche convertido de 19,20 metros de largo construído en 1947. Tiene un bastidor del tipo de cuatro cerchas y lo soportan bogies de chapa embutida. Los ganchos y enganches normales se han sustituídos a los de modelo continental más fuerte. Está equipado de un alternador accionado diesel que suministra la fuerza eléctrica para los instrumentos electrónicos, potentiométricos y otros más, así como para el alumbrado y la calefacción.

CONTINUED

Three interchangeable transducer measuring elements of drawbar effort are provided in the following ranges: 0–10 tons, 0–20 tons, and 0–30 tons. Essentially they consist of ground load-carrying billets, on which are mounted two matching strain gauges.

To prevent errors in the effort measurement on curves, the buffers at each side have been attached to the ends of a centrally-pivoted swing link. Arranging for this at both ends of the car constituted the greatest single modification to the underframe and running gear.

For measuring distance, the tyre profiles of one wheel set have an inclination of 1 in 100. A gearbox, mounted on what is normally the seat of the driving pulley of the train lighting generator, transmits distance run to the well of the traction console by a shaft drive. Compensation for tyre wear of the measuring wheels can be effected within the car.

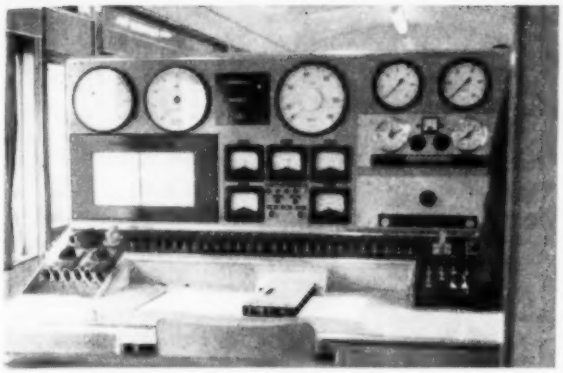
The measuring wheels are unbraked, involving a minor modification which has been carried out with standard parts.

The controlled road testing system determined to a great extent the design of the traction console. This system was evolved at Swindon and is now in use by all British Railways testing organizations.

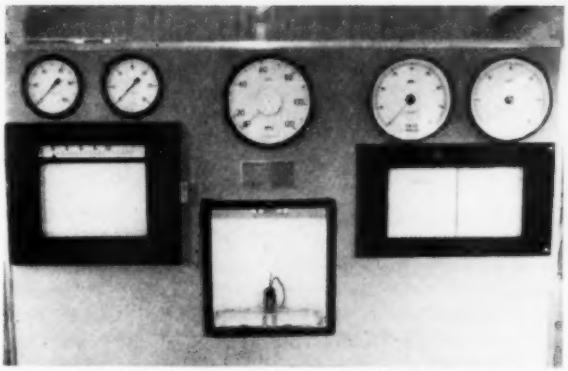
Before its appearance, analytical testing on the Continent and in Britain was always made at constant speed, obtained by use of braking units of various descriptions. The controlled road testing system, on the other hand, dispenses with braking units and employs a normal train running in the usual variable speed manner.

Fundamental difference between the systems is that constant speed testing operates under the third law of motion while controlled road testing operates under the second law: general equation of motion of a train. Control is exercised over the rate at which the working medium is used by the power unit — steam in steam locomotives and fuel oil in diesel. When this rate is constant, or is a function only of train speed, the actual drawbar effort-train speed relation is uniquely defined and is self-compensating for gradient effect. For steam locomotives, the necessary control is effected by using a specially developed flow indicator but in diesel locomotives it is even more readily obtained by placing the power controller in a pre-selected position. Altering the load for various rates of working provides all the flexibility required and the necessary fuel consumption can be readily determined by recording and integrating units of consumption produced by positive fuel meters.

Again, by these methods, acceleration



Instrument console—immediately visible from the conference room.
Console d'instruments—visible de la salle des conférences.
Das Instrumentenbrett vom Aufenthaltsraum aus gesehen.
Consola de instrumentos, visible desde el cuarto de conferencias.



Indications show drawbar hp, effort, speed, and air brake pressure.
Indications de puissance au crochet, effort, vitesse et pression d'air.
Daten über Zughakenleistung, Geschwindigkeit und Luftbremsdruck.
Indicaciones muestran HP de barras de tracción y velocidad.

can be measured accurately, making possible the production of the accelerating force per unit mass—train speed relation.

The system provides a valuable verification of the accelerating force-train speed relation, where a separate recording of train speed on a distance or time base is included in the dynamometer car. From the accelerating force-train speed curve and the known gradient conditions, the speed-distance curve can obviously be calculated.

Provision of the above facilities largely determines the layout of the traction console. Though a master running record of all the principal functions is still a necessity, it can be greatly reduced.

In the new car, facilities are incorporated in a console, which also centralizes the controls. Placed transversely across the end of the dynamometer room, the unit is 1.52 m high by 1.52 m wide and carries, in both forward and backward facing vertical panels, large dial indicating instruments of drawbar hp, drawbar effort, train speed, locomotive air brake pressure and train pipe vacuum. Indications on one side are clearly readable from all parts of the supplementary instrument section of the dynamometer room, and, on the other, from the central control panel and main recorder, and conference room beyond.

In addition to these indicators, the vertical panel on the central control carries the racks of electronic time and counting units, and also counters of work done, mileage run and distance run during braking etc. The other panel records train speed either on a distance base or, alternatively, on a convenient time base. The same panel carries the recorder of drawbar effort and train speed.

On the flat main recorder table a length of paper band is exposed, the band passing from the magazines below.

The electronic time and counting unit is in three parts, each housed in a standard rack, these being the stabilized power pack carried inside the console, the crystal oscillator and the counter, both of which are mounted in the vertical panel.

Distance is measured by the revolutions of one axle, transmitted by shaft drive to the well of the traction console, where the shaft is coupled to the input end of a positive forward—neutral—reverse clutch and gearbox. From this, the drive is taken to a splitter box which provides five output shafts running at 440 revolutions per 1.6 km.

The distance drives of the main and speed-distance recorders are taken from those.

For checking certain instruments, arrangements are made to motor the console mechanism, when declutched, from the normal drive. This is done by a motor-driven hydrostatic variator remotely controlled at the main recorder table.

The transducer measuring elements of drawbar effort and speed are used with potentiometric bridge units of the standard Dynamaster pattern, made by the Bristol Instrument Company. The voltage output is connected in a bridge circuit which is energized with a reference standard voltage.

Train acceleration is obtained from one of two induction generators with 50 c/s excitation running at 1760 revs/1.60 km. The output is electronically differentiated with respect to time and the resultant amplified to a level suitable for the corresponding bridge potentiometer unit and amplifier of the XY recorder.

The centralized control over the electrical equipment is situated on sloping panels between the main recorder and the adjacent vertical panel of the console. From this the diesel alternator can be started and stopped, its load applied and the frequency and voltage finely adjusted. The control panels also contain switches for the various transducers and potentiometric units, and of the electronic time and counting unit. Centrally, above the control panel and on the adjacent vertical panel of the console is the mains frequency meter.

The traction and central control console is situated almost in the center of the car.

One third of the fourth compartment from the dynamometer room is occupied by the 10-kw diesel alternator, operating on a power factor of 0.8. The 240v 50 c/s single phase transicon alternator is driven by a Lister 2 cyl. four stroke water cooled engine.

Air is drawn by the engine driven fan through a floor vent, from where it passes around the set and is expelled through the radiator and then the side panel louvres.

The compartment and corridor panels are removable for servicing while a roof panel can be removed for workshop repairs.

Mains voltage cables are taken through below-floor steel conduits. The instrument leads are carried in screened ducting. The run between the vestibule connection panels is situated on the corridor side, where it is placed immediately above the cant rail. A duct at the same vertical height runs in the opposite side of the dynamometer room and there are vertical drops to the alternator, the traction and central control console and six connection panels in the dynamometer room. All ducting has hinged doors throughout. The whole has been arranged so that leads may be laid out at floor level, harnessed, and lifted into position without threading.

The design of the car was prepared to the requirements of Mr. R. A. Smeddle, chief mechanical and electrical engineer, by his Research and Development (Rolling Stock) office at Swindon. The conversion was carried out in the Swindon Carriage and Wagon Works, which was also responsible for building the permanent instrumentation.

Turkey's Adapazari Car Shop

Railway systems in industrially underdeveloped nations are faced with a need for an unusual degree of self-sufficiency in meeting their requirements for materials and equipment. Not only do these nations lack a well-developed railway supply industry or a heavy industrial capability adequate to meet the needs of railway systems, shortages of foreign exchange often severely restrict the quantities of equipment and material that can be imported. As a result their railway systems must themselves develop an industrial plant—and the skilled manpower to operate it—capable of meeting a majority of their own needs. The system of modern and efficient shops developed by the Turkish State Railways (TCDD) to overhaul and repair its locomotives and cars, and to manufacture a large part of its new rolling stock requirements, represents one of Turkey's most highly developed industrial establishments.

TCDD's Shop Department operates four principal shops devoted to heavy repair and overhaul of locomotives and cars. The largest of them, at Sivas in central Turkey, handles all of the system's heavy steam locomotive repairs (about 25 per month), as well as freight and passenger car overhaul and repair. In addition, Sivas manufactures virtually all of Turkey's new freight cars. Maximum capacity of the plant is 1,000 new double-axle cars annually. Presently, Turkey imports only a limited number of specialized four-axle freight cars, and it is probable that TCDD shops will undertake manufacture of even this equipment in the near future.

The Sivas machine shop, forge, and foundry supply material for TCDD's other shops as well as the Sivas shops. The Sivas foundry, which manufactures both ferrous and non-ferrous castings, is one of the largest and best equipped in Turkey, and is occasionally called upon to manufacture large or difficult castings for other Turkish industries.

Extensive TCDD shops at Eskisehir, in west-central Turkey, perform locomotive and freight car repairs, manufacture tools and parts for their own needs and those of other shops, and fabricate structural steel for bridges and other requirements.

The overhaul of diesel-powered locomotives and rail cars is presently performed at a modest shop facility in Ankara. However, in preparation for an increased use of diesel motive power planned for the near future, an extensive new diesel heavy repair and maintenance shop is now under construction at Guvercin, 8 kilometers west of Ankara.

The newest and most modern of the principal TCDD shops, and a good example of the high level of self-sufficiency attained on the Turkish system, is the freight and passenger car shop at Adapazari, 140 kilometers east of Istanbul.

Opened in 1951, the Adapazari shop is devoted principally to major overhaul of freight and passenger cars, with a maximum capacity of 120 passenger cars and 400 freight cars monthly. Major overhauls account for about 80% of the plant's work volume, with minor repairs accounting for the remainder. A total work force of 1,250 men is employed at the plant.

Prior to actual construction of the shop, which was planned entirely by Turkish railwaymen, a limited number of key employees were sent to Germany and the United States to observe modern practices at similar facilities operated by railway companies or railway suppliers.

The two principal shop divisions at Adapazari are the separate freight and passenger car repair shops, which are arranged to permit car overhaul on a production line basis. Supporting these two main shops are shops devoted to repair or fabrication of the various materials and components required for car overhaul. All of these shops are highly mechanized with modern machine tools and equipment, largely of US or German origin. Material handling between the separate shop areas is mechanized with a system of "skid boxes" and battery-powered skid lift trucks.

After passing through a separate structure for cleaning and paint removal, passenger cars enter the main shop building

Resistance welding machines are used to butt weld spring hanger rod sections

Postes de soudure à résistance utilisés pour le soudage en bout des supports de barres à ressort.

Widerstandsschweissapparate zum Stumpfschweissen von Federbockstangen.

Soldadura a tope de secciones de soportes de muelle.

on one of three disassembly tracks, where seats, hardware, and equipment are removed. Cars are then moved by transfer table to one of twelve repair tracks equipped with staging for car body repair and overhaul, and jacks for bogie removal. Bogies are then moved to a separate area for overhaul and repair. A separate entrance to the transfer table, bypassing the disassembly line, is available for passenger cars scheduled for light repairs only.

Following completion of car body repairs, and reinstallation of bogies, passenger cars are moved by transfer table to one of three assembly tracks, where they move in the opposite direction but parallel to cars on the disassembly tracks. Located between the assembly and disassembly areas are shops and equipment for overhaul and repair of the various components and equipment removed during the disassembly process. Following complete reassembly, passenger cars are moved into the paint shop area, where final painting is accomplished by either brush or spray methods.

The flow of freight car overhaul and repair is generally similar to that for passenger car work. Four tracks into the main shop building are available for freight cars, two for heavy repairs and two for light repairs. A second entrance, bypassing the disassembly area, is provided for cars requiring minor repairs only, and two additional tracks lead to special tank car repair pits. After removal of wheels and axles, freight cars are normally moved by overhead traveling cranes. Upon completion of all repairs, freight cars are moved outside the shop building for spray painting.

Among the principal supporting shop groups are a sawmill, woodworking shop, and cabinet shop; a paint shop; an electric shop; a blacksmith shop; a machine shop; a bogie repair shop; a brake valve repair shop; and a separate group which disassembles and assembles brake systems. The largest of these supporting shops is that which performs bogie overhaul and repair. Included in its major equipment for wheel and axle are wheel, axle, and tire lathes; an axle press; and a machine for building up worn flanges by continuous arc welding and grinding.

The Adapazari shop is organized into five divisions reporting to the Director, Mr. Celal Taner. Chief among them are the Operations and Technical divisions, each of which is headed by a chief engineer. The Technical Division is responsible for engineering work and specifications, scheduling, time studies, and material supply and handling. The Operations Division supervises all of the

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L'Atelier de Réparations d'Adapazari, en Turquie

Dans certains pays industriels sous-développés les chemins de fer envisagent serieusement de s'approvisionner eux-mêmes en material et en outillage. Non seulement ces pays manquent d'industries de fournitures ferroviaires, ou d'une capacité industrielle lourde pour y faire face, la pénurie de devises étrangères restreint souvent d'une façon sévère les quantités de matériel et d'outillage pouvant être importés. Il en découle que leurs systèmes ferroviaires doivent développer eux-mêmes une organisation industrielle capable de subvenir à leurs besoins — ainsi que la main d'oeuvre spécialisée pour la faire marcher. Le système d'ateliers modernes et efficients développé par les Chemins de Fer de Turquie (TCDD) pour la révision, la réparation des locomotives, des voitures et des wagons et la fabrication d'une grande partie de matériel roulant neuf, représente un des développements industriels les plus remarquables en Turquie. Le Département Ateliers de la TCDD dirige quatre ateliers principaux de réparations lourdes et révisions de locomotives, voitures et wagons. Le plus récent et le plus moderne est celui de wagons et de voitures à Adapazari, à 140 km à l'est d'Istanboul. L'atelier a une capacité maximum de 120 voitures et 400 wagons par mois et emploit 1250 hommes. On projette la production de nouvelles voitures à double bogies à l'atelier d'Adapazari.

Adapazari Waggon-Werke, Türkei

Die Eisenbahnbetriebe in Entwicklungsländern haben in ungemein energischer Weise die Deckung ihres Bedarfs an Material und Ausrüstung in eigene Hand genommen. Diesen Nationen fehlt es nicht nur an einer gut entwickelten Eisenbahnzubehör- oder tauglichen Schwerindustrie, die imstande wäre, den Mangel an Eisenbahnmaterial zu beheben, sondern auch an Devisen, um dieses aus dem Ausland zu beziehen. Die Folge ist, dass ihre Eisenbahnbetriebe selbst Industrieanlagen entwickeln und das Personal, diese zu bedienen, schulen müssen, um den grössten Teil ihres eigenen Bedarfs aufzufangen. Die von der türkischen Staatsbahn (TCDD) entwickelten Industrieanlagen für eine zweckentsprechende Inspektion und Ausbesserung ihrer Lokomotiven und Wagen sowie für die Herstellung eines grossen Teiles des neu anzuschaffenden Materials, gehören zu den leistungsfähigsten Spitzenbetrieben der Türkei. Die Industrieabteilung der TCDD umfasst vier Hauptwerke, die für die grossen Ausbesserungsarbeiten von Lokomotiven und Wagen bestimmt sind. Das jüngste und modernste ist das Reisezug- und Güterwagen-Werk in Adapazari, 140 km östlich von Instanbul. Das Werk hat eine Höchstleistung von 120 Reisezug- und 400 Güterwagen pro Monat und arbeitet mit einer 1250-köpfigen Belegschaft. Programmiert wurde ebenfalls die Herstellung neuer Reisezugwagen mit doppeltem Drehgestell.

Los Talleres para Carros de Adapazari en Turquía

En las naciones subdesarrollados los ferrocarriles enfrentan el problema de que han de acudir a sus propios recursos para cubrir sus necesidades de materiales y equipos. No sólo estas naciones carecen de una industria ferrocarrilera y de la capacidad industrial adecuada a las demandas de la red ferroviaria, sino que la escasez de divisas restringe en la mayoría de las veces las cantidades de equipos y materiales que se puedan importar. Con esos motivos sus ferrocarriles mismos han de establecer una planta industrial y formar la mano de obra especializada para su operación a fin de que puedan servir la mayoría de sus demandas. El sistema de talleres modernos y eficientes tal como establecido por los Ferrocarriles Nacionales Turcos (TCDD) con el objetivo de revisar y reparar sus locomotoras y carros y de producir gran parte de sus necesidades de material rodante, representa una de las plantas industriales más desarrolladas de Turquía. La Sección de Talleres de los TCDD dirige cuatro talleres, en los que se efectúan reparaciones y revisiones de locomotoras y carros. El más moderno es el para vagones de carga y coches en Adapazari, 140 kilómetros al este de Istanbul. Tiene una capacidad máxima de 120 coches y 400 carros de carga mensuales y da trabajo a 1.250 personas. Se está elaborando un proyecto para la producción de coches de bogies.

Skilled workers—like this lathe operator—are in short supply in Turkey.
La main d'oeuvre spécialisée—telle que ce tourneur—manque en Turquie.
Geschulte Arbeiter—wie dieser Drehbankmonteur— sind in der Türkei selten.
Obreros especializados como este tornero escasean en Turquía.

TURKEY'S ADAPAZARI CAR SHOP

CONTINUED

actual shop work at Adapazari. Other divisions include plant maintenance, accounting, and security. An entirely separate group, responsible directly to the railway system's mechanical department, performs acceptance tests of completed work from the shop.

Many of the materials and parts required at Adapazari are manufactured by the shop itself, or are obtained from the other TCDD shops. Sivas and Eskisehir produce virtually all of the hardware and fittings required at Adapazari. The plant's spring shop manufactures its own leaf springs, which are made from Turkish produced steel. The Adapazari bearing shop is capable of casting babbitt friction bearings. Journal boxes and brass bearing shells are manufactured at Sivas and Eskisehir. All of the lumber used at Adapazari is produced in Turkey, and much of the paint required is either mixed in the plant's paint shop or is obtained from Turkish paint factories.

Much of the material used at Adapazari, however, particularly that of a precision of highly technical nature, must still be imported. Most of the steel used by the plant must come from foreign sources, since few steels of the types required by the car shops are manufactured in Turkey. Coil springs, steel wheels, and tires must also be imported, although the Sivas foundry has recently begun casting some wheels. Roller bearings, air brake parts, and passenger car electrical and heating equipment are also among the items that must be imported.

Just as important as the railway system's need for a highly developed industrial plant is its requirement for a skilled labor force. But skilled workmen are in short supply in Turkey, and TCDD learned long ago that it must become self-sufficient in training skilled labor just as it must in its industrial capability. As a result the Turkish railways operate one of the most extensive, and the most effective, apprentice training programs in Turkish industry.

When the new Adapazari car shop was opened TCDD began operation with already skilled key employees transferred from other system shops, plus what skilled or semi-skilled workers it could recruit from outside the railway system. Almost immediately, however, the same comprehensive apprentice program operated at other TCDD shops was installed. Since 1960 Adapazari has been able to rely entirely on the output of this apprentice program—about 50 to 60 skilled workers annually—to fill all of its manpower requirements.

Boys enter the four-year TCDD apprenticeship program between the ages of 12 and 15. The first two years of the program are devoted to schooling and general mechanical training. Apprentices spend about 10 to 15 hours a week in the classroom, while the remainder of their time is spent under instruction in a special apprentice training shop. During the last two years of the program apprentices are separated according to their prospective trades, and receive further training by working in the car shops as helpers to regular tradesmen. TCDD feels that it begins to obtain some benefit from its apprentices after two years, and considers them fully qualified at the end of four years.

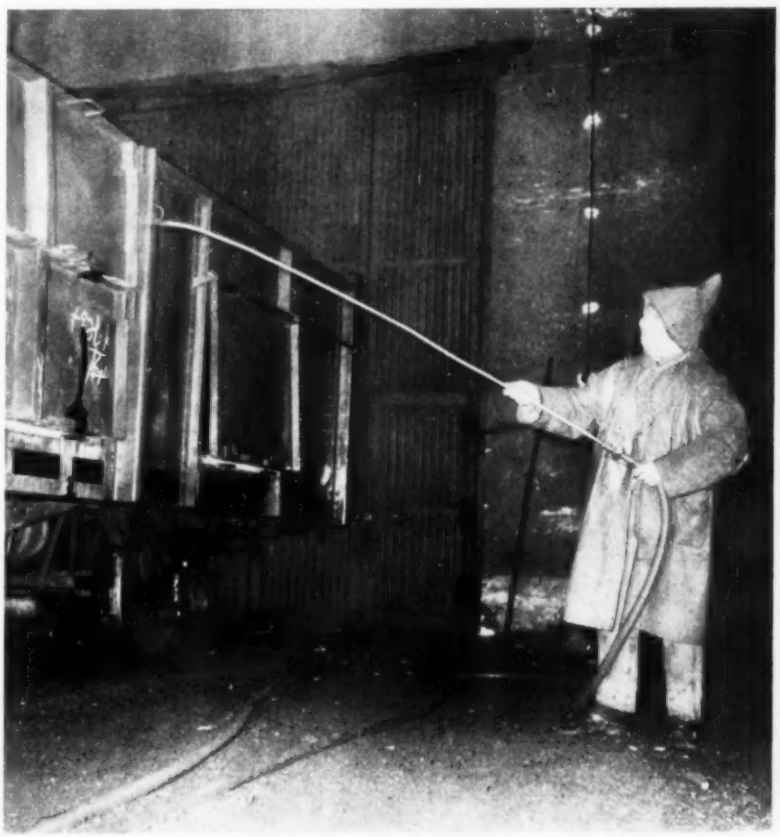
Because of good working conditions and liberal welfare benefits for employees of Turkey's state railways, the Adapazari shops find that there is always a sufficient number of applicants for the apprentice program to permit the plant to "pick and choose" the most promising candidates. Among the many benefits contributing to the desirability of TCDD employment

Welders assemble one of two passenger car bogies recently fabricated as a preliminary to a planned program of passenger car production.
Soudeurs assemblant un des deux bogies de voiture récemment fabriqués, préléminaire au programme projeté de la production de voitures.
Schweisser montieren eines der beiden Drehgestelle, das kürzlich als Vorläufer eines Planungsprogrammes für Reisezugwagen gefertigt wurde.
Montaje de uno dos bogies de coches fabricados recientemente como preparación de un programa de producción de coches.

are full medical care for employees and their families in plant dispensaries and in hospitals operated by the railway at Ankara, Sivas, Eskisehir, and Istanbul; free lunch programs; free work clothing; an excellent retirement program; and a social insurance fund that provides such benefits as life insurance and home loans. To encourage the sons of TCDD workers to follow a career in the railway industry, they are given preference in joining the system's apprentice programs.

With the exception of a few double-axle passenger cars built at the Eskisehir shops, TCDD has not yet attempted to manufacture its own passenger rolling stock. Presently, however, tentative preparations are being made for a program of limited production of new double-bogie passenger cars at the Adapazari shops. As a trial the plant recently undertook complete reconstruction of a coach which had been destroyed by fire. Except for re-use of the frame and bogies, the job amounted virtually to construction of a new car. Even more recently the plant has succesfully completed the fabrication of a pair of welded passenger car bogies.

Highly pleased with the quality of workmanship demonstrated by his work force, Adapazari car shop director Taner is confident that they can succesfully take on the job of new passenger car construction, and thus move the Turkish railway system one step further along the road to full self-sufficiency.



An overhauled double-axle steel gondola car is spray painted in paint shop area.
Wagon tombereau en acier à double essieu aprés révision est peint au pistolet.
Ein überholter offener Stahlwaggon erhielt seinen Anstrich in der Farbspritz-Anlage.
Vagón de doble eje es pintado después de la revisión.

France: New Suburban Electrics

Four three-car 25 kv 50-cycle AC suburban trains form the prototype equipment for French Railways' forthcoming suburban electrified services out of the Nord and Est stations in Paris. Three of the four sets are now being tested under intensive traffic conditions and the fourth will be completed in the near future. The eventual requirements of the suburban services are 154 three-car trains.

Each train consists of a powered driving car with one motored bogie, a trailer car and a driving trailer car. Three of the powered cars—Z9056, Z9057 and Z9059—are identical in principle and can be run in multiple unit. Powered car Z9058 differs in its electrical equipment, having a single-phase traction motor fed from silicon rectifiers, as on the other cars.

They all seat 303 passengers and have standing room for a further 148. Body and chassis are mainly of welded stainless steel, constructed on the Budd principle. Certain components are of arc-welded carbon steel. To facilitate passenger loading and unloading, the floor level is lower than usual, being only 0.900 m above rail level. There are three sets of double doors on each side of each car, with manual opening and automatic closing. Apart from a 40-seat section in each driving car, accommodations are second class.

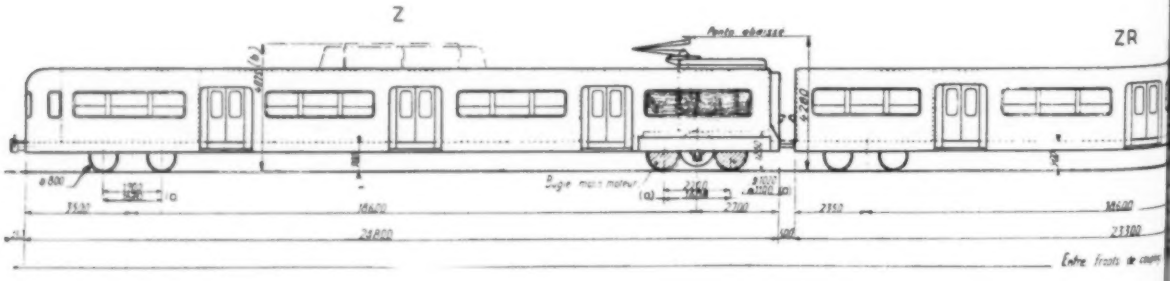
Maximum speed is 120 km/h, except for Z9058 which has a top speed of 100 km/h. A powered car weighs 51.2 metric tons, a trailer car 26.9 metric tons and a driving trailer car 29.5 metric tons. One hour rating is 750 kw for Z9056, 9057 and 9059 and 685 kw for Z9058.

There are two types of motor and trailer bogies used. The motor bogies on the sets equipped with DC traction motors have a single frame-mounted motor with axles coupled through gear trains. The frame is of welded steel construction. The bogie frame rests on coil springs supported by longitudinal equalizing beams. Guidance between running gear and bogie chassis is by means of two articulated rods. The axles have external journals with wheel diameters of 1.020 m.

The gear train consists of two main gear wheels, two intermediate gear wheels and the motor pinion. The pinion shaft passes through the hollow armature shaft and is coupled through a rubber ring sandwiched between plates. This gives a high degree of torsion flexibility.

The motor bogie on car Z9058 is similar to that used on the BB 16500 25 kv series of electric locomotives. The variable gear ratio is not, however, required on a train set for suburban service. Axles have inside journals and wheels of 1m in diameter. The axleboxes are supported on articulated rods on "silentblocs." The bogie chassis is of welded steel plate and suspension is by spiral springs and equalizers. The motor, placed centrally, drives the gear train through an Alsthom elastic coupling and torsion shaft. Four vertical supports on the bogie take the weight of the car body. Brakes are the Knorr disc type with two discs per axle.

Powered cars are equipped with a single Faiveley type AM pneumatically controlled pantograph. The three units



Prototypes de Trains Electriques à l'Essai en France

Quatre trains de banlieue 25 kv 50 cycles CA à trois voitures constituent le matériel prototype pour les prochains services suburbains électrifiés des Chemins de Fer Français des gares du Nord et de l'Est à Paris. Trois des quatre sont actuellement en l'essai dans des conditions intensives de trafic et le quatrième sera achevé prochainement. Les services de banlieue auront besoin de 154 trains à trois voitures. Chaque train est composé d'une voiture à poste de commande et un bogie moteur, une remorque ferroviaire et une remorque à poste de commande. Trois des voitures à force motrice sont principalement identiques et peuvent rouler en unités multiples. Une diffère dans l'installation électrique.

Probefahren elektrischer Musterzüge in Frankreich

Vier Prototypen Dreiwagenzüge für den Nahverkehr, 25 kV-50 Hz-Wechselstrom, werden im Rahmen der programmierten Elektrifizierung des französischen Nahverkehrs vom Pariser Nord- und Ostbahnhof aus, erprobt. Drei der vier fahren bereits unter intensiver Verkehrsbeanspruchung und der vierte wird in absehbarer Zeit einsatzbereit sein. Insgesamt sind 154 Dreiwagenzüge vorgesehen. Jeder Zug besteht aus einem Triebwagen mit Triebdrehgestell, einem Beiwagen und einem Beiwagen mit Antriebsvorrichtung. Drei der Triebwagen haben dasselbe Prinzip und können in Mehrfacheinheiten laufen. Einer hat ein anderes elektrisches System.

En Francia se hacen pruebas con un prototipo de trenes eléctricos

Cuatro trenes de cercanías de 25 kv, 50 períodos CA, son el material prototipo para el servicio electrificado de cercanías de París. Tres de los cuatro corren actualmente bajo condiciones de tráfico intenso y el cuarto se pondrá en servicio dentro de breve tiempo. Los servicios de cercanías necesitarán eventualmente 154 trenes de tres coches. Cada tren consiste de un coche con puesto de conducción y bogie motor, un remolque y un remolque con puesto de conducción. Tres de los coches con motor son idénticos en principio y se pueden utilizar en una unidad múltiple. Uno tiene un equipo eléctrico diferente. Todos tienen una capacidad de 303 personas y espacio de pie para 148.

Z9056, 9057 and 9059 have all main circuits protected by a 25 kv type DBTF pneumatically controlled circuit breaker. The transformer is placed in the car body above the motor bogie and is cooled by oil circulation; incorporating a primary high tension winding and secondary traction winding. The tap changer is operated by a servo-motor and there are 22 voltage steps. There are two secondary windings, one feeding the heating circuit at 1500-volts and the other the auxiliaries circuit at 220-volts. The apparent power to the traction winding at 25 kv is 920 kva. The weight of the transformer with oil is 3600 kg.

Each of the powered cars (except Z9058) have different types of silicon semi-conductor rectifiers. In each case the cell assembly is arranged to achieve the following:

Starting intensity — 1150 amps.

Continuous supply intensity — 870 amps.

The construction of the rectifier block of Z9056 contains 80 silicon cells arranged in removable trays with ventilating air passing from top to bottom. The rectifying block of Z9057 has 144 silicon cells arranged in a semi-circle, through which ventilating air is sucked horizontally before it is released through the floor of the car. In both Z9056 and Z9057 the rectifier blocks are placed alongside the main transformer assembly.

In car Z9059 the 144 silicon cells are placed under a roof-mounted housing and are naturally ventilated. Rectifiers are protected by an ultra-rapid short-circuiting device with a response time of from two to three milliseconds. This causes short circuiting of the secondary traction and opens the main circuit breaker in the event of an overcharge which the rectifier cannot take. Each rectifier also has a system for revealing any damaged cells.

The traction motor is the series excitation type with six poles; compensated and self-ventilated.

Characteristics are as follows:

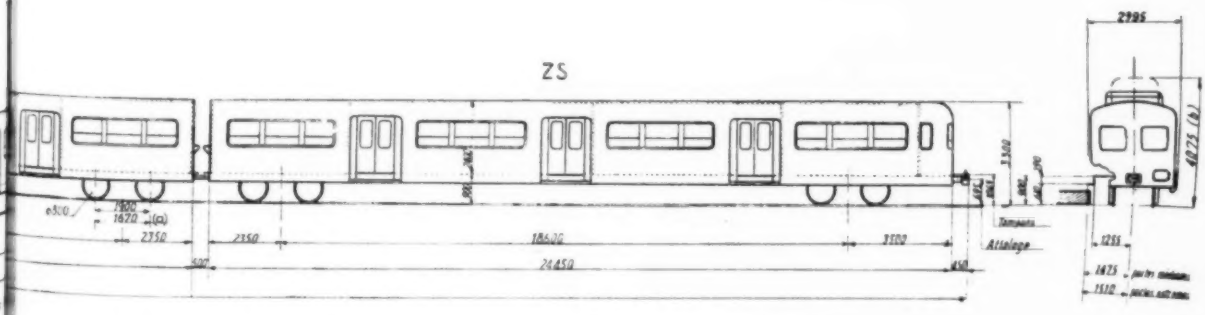
voltage – 850 volts
intensity – 870 amps
output – 690 kw (940-hp)
starting intensity – 1150 amps
weight – 4150 kg

The unit Z9058 has an AC singlephase 50-cycles traction motor which has 20 poles; compensated and force ventilated. Characteristics are as follows:

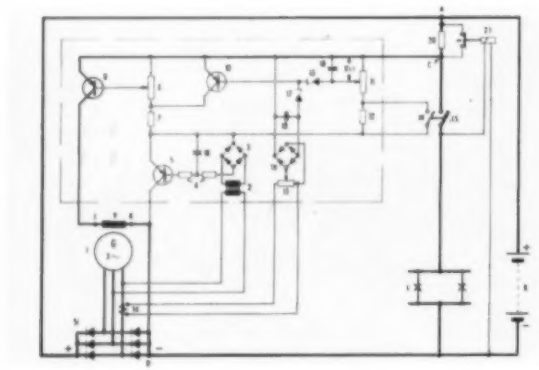
voltage – 320 volts
intensity – 2750 amps
output – 685 kw (930 hp)
starting intensity – 4500 amps
weight – 5300 kg

The traction motor is supplied at varying voltages from a Pruneau transformer which allows speed regulation by continuous adjustment of the voltage. Automatic starting is controlled by an electronic device acting as an acceleration relay, the regulation of which can be altered at will by the driver.

Pantograph, circuit breaker, compressor, oil motor pump group, heating and lighting circuits are identical on all four units. Heating in the passenger cars is effected by 1000-w—1500-volt radiators. Fluorescent lighting is at a voltage of 220. There is also an emergency lighting circuit fed from the battery.



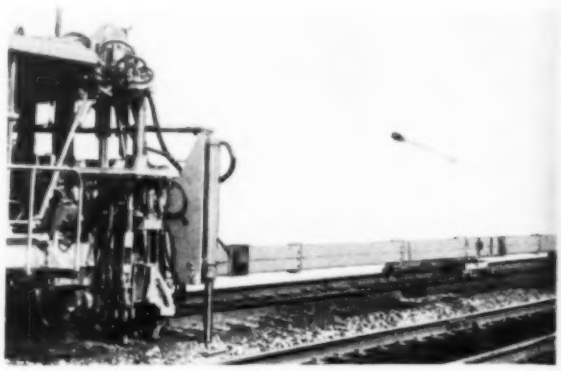
Products of Interest



Transistorized Level-Crossing System

Signalisation de passage à niveau entièrement à transistors.
Völlig transistoriertes Niveaukreuzungssignalsystem.
Introducción de señalización transistorizada para pasos a nivel.

Latest techniques of transistor technology and "building-block" electronic circuitry are employed in a new level-crossing signaling system shown at the German Industries Fair in Hannover this spring. The basic unit includes 36 standardized plug-in units, hermetically sealed and easily replaceable. Designed for single track operation, with flashing light signals, the basic system can be doubled for doubletrack working. *Pintsch Bamag AG, West Germany.* **IRJ 1**



Computer Controlled Track Surfacer

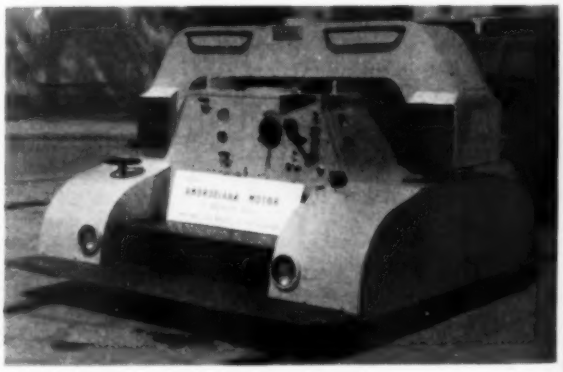
Dressage de la voie, système commandé par "computer."
Analogrechner im Dienst der Eisenbahnschienen-Auftragschweissung.
Rectificación de la vía mediante una técnica de máquinas calculadoras.

Based on a completely new concept, a computer-controlled technique for surfacing railroad track has been developed. The RMC Electronic Surfacing Device is used in conjunction with a jacking tamper to level track at any speed needed for any combination of tampers. The track is held to grade for finish tamping by one or more tampers following. The computer automatically calculates desired grade. *Railway Maintenance Corp, USA.* **IRJ 2**

High Speed Data Transmission

Transmission ultra-rapide de données par téléphone.
Schnelle Datenvermittlung wird durch Telefon erreicht.
Se ha logrado transmisión rápida de datos por líneas telefónicas.

Transmission of data at 1,000 words per minute, can be achieved complete with error checking facilities over telephone lines. The Dial-o-verter system works in conjunction with digital subsets. It can transmit data between any combination of punched paper tape, magnetic tape or punched card terminals. For example data can be taken from a paper tape and transmitted to the receiving end where it is put on magnetic tape. *Digitronics Corp., USA.* **IRJ 3**

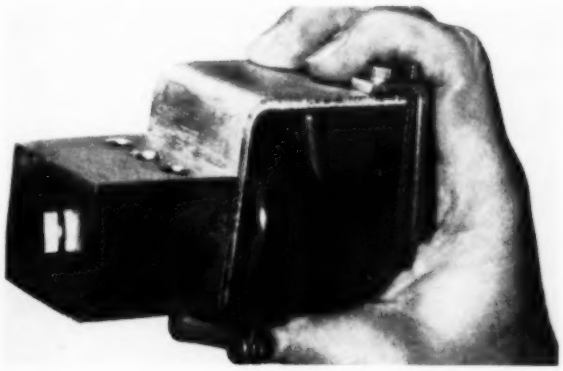


Midget Diesel Shown at Milan

Tracteur de manoeuvres STEMAG, fonctionnement simple, économique.
STEMAG Rangiertraktor—einfache Bedienung—wirtschaftlich.
Tractor de maniobras STEMAG tiene operación sencilla y económica.

Stemag's new diesel tractor, shown at the 1961 Milano Trade Fair, features a simple design, ease of operation, and increased flexibility. Powered by a 36-hp diesel engine (40 hp on request), the tractor is driven through a two-speed hydraulic transmission. The pivoted buffer beam raises hydraulically under the car buffers, making part of the car weight available for traction. The unit will handle up to 350 tons on straight and level track, at 10 km/h. *G. Stefani, Italy.* **IRJ 4**

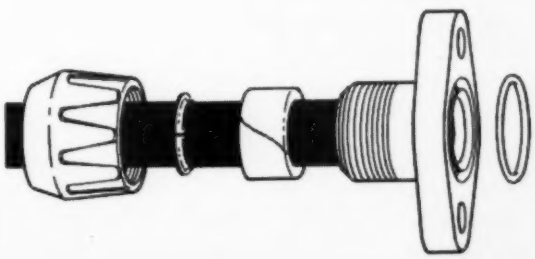
From Railway Suppliers



Magnetic Valve Has Encapsulated Coil

Soupape magnétique avec bobine en capsule, éléminant dommages ratés.
Magnetventil mit eingekapselten Spulen ist sehr widerstandsfähig.
Válvula magnética con bobina en cápsula resiste a avería e incidentes.

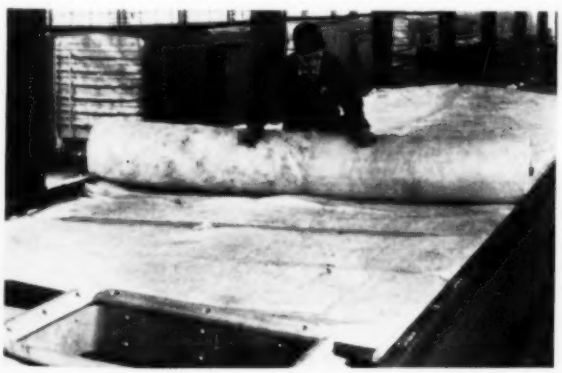
Features of a new magnet valve for use with pneumatic devices on diesel-electric road locomotives include an encapsulated coil that is said to resist mechanical damage and eliminate failure caused by dirt, etc. Also featured is a metal seat that, according to design engineers, assures trouble free operation up to six years without inspection or cleaning. The electrical design is claimed to prevent overloading of circuit relays. *General Electric Company, USA.* **IRJ 5**



Pipe Fittings Eliminate Costly Delays

Garnitures de tubes éléminant retards par suite de fuites d'air.
Rohrpassungen gegen Störung durch lecke Luftdruck bremsen.
Juntas de tubería eliminan fugas en frenos neumáticos.

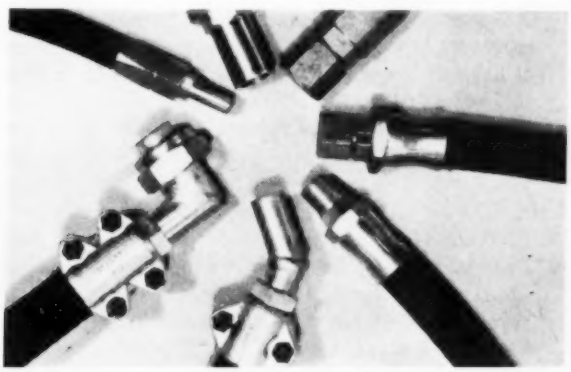
New Gripseal pipe fittings are designed to eliminate the costly delays occasioned by leaks in the air brake system. These fittings are said to provide a positive seal regardless of temperature variations from —50° to 200° F. The pipe is firmly gripped by Teflon coated compression ring of special temperature compound. This coating eliminates twisting or galling of the ring when the nut is tightened. *The New York Air Brake Co, USA.* **IRJ 6**



Transportation Insulation

Isolation de transport montre bonne résistance à l'affaisement.
Der Transport-Isolator bewährt sich mit gutem Erfolg.
Aislante de transportación tiene buena resistencia.

PF-330T transportation insulation, after an extensive immersion, freezing and thawing test with the Fruehauf Trailer Co., of the USA, is said to have shown excellent slump resistance and thickness retention. After a 12-cycle MDT vibration test covering a period of seven weeks, the insulation displayed no sagging, loss of thickness or distintegration, according to the manufacturer. *Owens-Corning Fiberglas Corp., USA.* **IRJ 7**



New Additions To Ermeto Range

Nouveaux modèles avec de grande gamme de raccords de tube.
Grosse Auswahl in Rohrkupplungen mit vielen neuen Modellen.
Amplia serie de juntas de tubería incluye nuevos modelos.

Interesting additions to the Ermeto range recently exhibited at the International Plastics Exhibition in London include high pressure flexible hose with twin-saddle and re-usable end fittings, together with a range of balanced and relief valves. The full range includes high pressure pipe couplings in mild steel, stainless steel and brass, shut off, angle, bonnet and fine control valves, together with a selection of gate valves. *British Ermeto Corp., Ltd., England.* **IRJ 8**

FRANCE: Preview of SNCF's annual report for 1960 indicates a new production record of 88,500 million kilometer units. Operating receipts climbed 4.2% to 8100 million NF. Operating expenditures increased 4.9% to 8350 million NF. Freight tonnage rose 6% to 293 million tons. Passenger traffic and receipts rose 1.8%. Train speeds increased as a result of electrification of 321 km of line. Total number of railroad personnel was reduced 4000 to 353,581.

MEXICO: According to the Bank of Foreign Trade Freight Department, the Mexican National Railways hauled 20,106,000 tons of freight during the period, January to October, 1960. In October 1959, 1,800 million tons were hauled—an increase of 200 million tons over the 1,600 million tons hauled in the same month of 1958. Leading commodoties were tobacco, newsprint, alcohol, construction materials, staples, minerals and ore.

. . . The Chihuaha and Pacific Railway is scheduled for inauguration this month and will run from Topolobampo to Ojinaga, Chihuahua.

. . . Work is due for completion this month on the new Achotal-Medias Aguas (Veracruz) short line. This will shorten the Mexico to Merida trip by 50 km. Latest information reveals that work on the Coatzacoalcos River bridge is being rushed in order to meet the deadline.

NETHERLANDS: The Netherlands State Railways report a profit of $3,600,000 (US) for 1960, an increase of $900,000 over 1959. Freight traffic rose 7.6% to 26.4 million tons. Passenger traffic climbed 3.6%, and passenger revenues 3%. The average age of freight rolling stock was reduced from 16.4 years in 1959 to 15.7 years in 1960. Some 700 large freight cars (82 m^3 and 26 tons) and the first batch of open hopper cars (60 m^3 and 28 tons) are scheduled to be delivered this year.

NEW ZEALAND: The financial position of the New Zealand Railways has improved for the third year in succession. Excluding interest charges, the loss for the year ended 31 March 1961 was reduced from the March 1960 figure of £563,133 to £62,759. Freight tonnage rose by 276,000 tons to set a new yearly record of 10,819,000 tons.

SWITZERLAND: Two major steps to streamline administrative operations and to improve rail service have been announced by the Swiss Federal: (1) acquisition of a high speed data processing system and (2) new equipment for the Trans Europe Express (TEE) network, now linking some 80 principal European cities. The IBM 7070/1401 combination will be used to compute freight charges, compile statistics, and to increase efficient utilization and control of car inventories. Four new five-unit passenger trains, each powered by a 3400 hp locomotive capable of operating on each of the four different electrical systems in Western Europe through pushbutton adjustment (IRJ, March, page 18) are scheduled to to be placed into service this month.

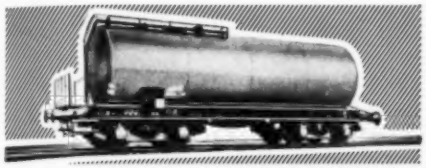
TURKEY: Work on the new railway line between Mus and Tatvan, in eastern Turkey, is being progressed further this summer, with completion of the line scheduled by the end of 1962. The new line is an extension of the Turkish State Railways. The four tunnels on the line will be finished this summer, major culvert and bridge work is already completed, and crushed stone ballast is being stockpiled in anticipation of early delivery of rail. The rail will be fabricated in Turkey. Initial work has also begun on at least one of the stations on the new line. About 1,500 men are working on the railway project this summer.

UGANDA: The new Jinja-Bukonte rail line is now in service, providing a route that is 72.4 km shorter than the one formerly in use. The more rapid transit time which results will not only improve passenger and freight service, but will produce operating economies estimated at £140,000 per year. Train-miles will be reduced as much as 173,000 annually. Construction of the new 74.3 km line required 21 months and costs totaled approximately £1,500,000. The line has maximum curvature of 4 deg. and a ruling gradient of 1%. Rail is 75- and 80-lb on steel sleepers, and the track is ballasted principally with slag. Altogether, 140 culverts, as well as several major bridges, were installed. The route in use before completion of the new cut-off will be retained. It serves northern Busoga district and forms part of a rail route to north and northwest Uganda. In the latter region, work is progressing on extending the Soroti branch to Lira and agreement has now been reached, in principle, to extend the branch onward to Gulu.

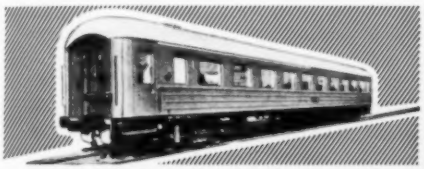
UNITED STATES: Estimates compiled by the Interstate Commerce Commission indicate that major US railways will make capital expenditures for road and equipment totaling $556,900,000 in 1961. For the first half of 1961, these expenditures are estimated at $330,100,000. If these preliminary estimates prove correct, they will be substantially below actual expenditures made in 1960.

WEST GERMANY: Container traffic continues to increase on the German Federal. Five years ago DB's container tonnage was less than 2,500,000. Last year it handled 4,500,000 tons in 15-ton and one-ton containers. To cope with the growing demand for this type of door-to-door service, DB has 3,000 large and 10,000 small containers scheduled for delivery this year.

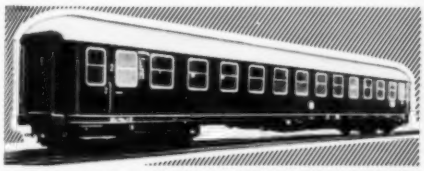
Diesel locomotive of the Danish State Railways, built by A/S Frichs, Aarhus



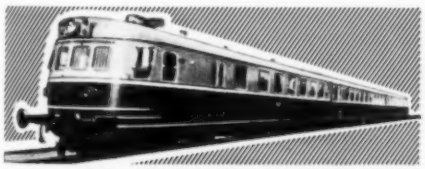
Tank wagon of the Iranian State Railways, built by Linke-Hofmann-Busch, Salzgitter Watenstedt



Passenger coach of the Swedish company TGOJ, built by Kockums, Malmö



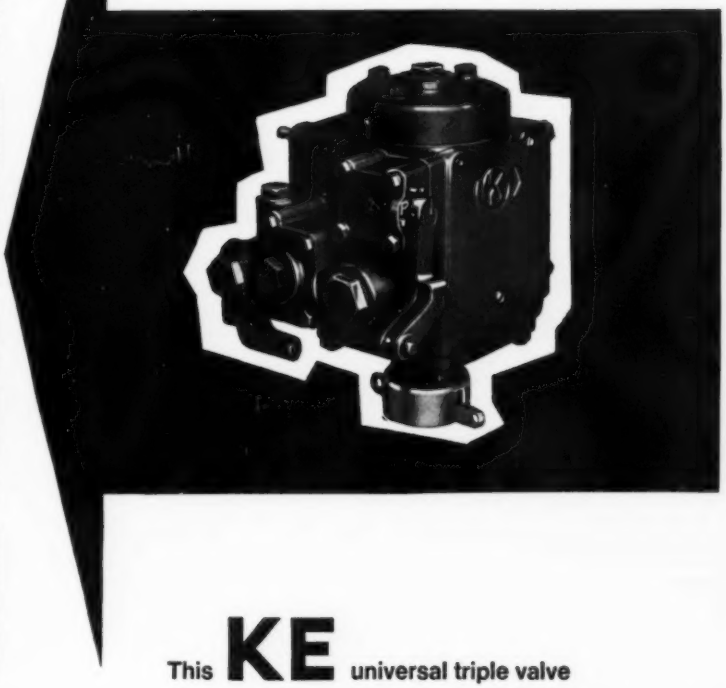
Express train coach of the German Federal Railways, built by Rathgeber, Munich



Railcar train of the Norwegian State Railways, built by A/S Strömmens Vaerksted, Strömmens

Single-engined railbus of the British Railways, built by Waggon- und Maschinenbau GmbH, Donauwörth

Knorr KE Type Air-Brakes for all Rail Vehicles



This **KE** universal triple valve forms the basis of the brake equipment for all types of rolling stock: locomotives, passenger coaches and goods wagons as well as railcars and railbuses. By the attachment of accessory components the action of the valve can be extended to meet the highest demands. The Knorr KE air-brake offers the maximum degree of security and economy. Up to now KE brakes have been supplied to 28 countries in the world.

KNORR-BREMSE GMBH MUNICH W. Germany

WORLD POLL

Railway operating techniques have always required some degree of special training for certain categories of railwaymen, and training schools and apprenticeship programs have been established by many railway systems in all parts of the world. Recent changes, particularly since the war, have had a considerable effect on these established training programs on a number of major railway systems. In fact, on most railway systems today the large number of staff employed and the many overall requirements of satisfactory performance, compel a steady intensification and expansion of training facilities. Moreover, recent technical changes require the provision of retraining programs. These trends are illustrated in a round-the-world poll, issued by the International Labor Organization.

L'exploitation d'un système ferroviaire a toujours exigé un certain degré de formation spéciale pour certaines catégories de cheminots. Des écoles de formation et des programmes d'apprentissage ont été établis par les chemins de fer dans le monde entier. Des modifications récentes, particulièrement depuis la guerre, ont considérablement influencé les programmes de formation existants d'un bon nombre de sociétés ferroviaires. Chez la plupart le nombre considérable du personnel ainsi que les exigences de rendement satisfaisant, entrainent l'intensification et l'expansion continue reguliere des systèmes de formation. En outre les modifications techniques récentes exigent des programmes de rééducation. Ces idées sont reflétées dans une enquête mondiale, organisée par l'Organisation Internationale du Travail.

Eisenbahnbetriebstechniken beanspruchen seit jeher eine vielseitige Spezialausbildung bestimmter Kategorien von Eisenbahnangestellten, so dass Eisenbahnverwaltungen in aller Welt Ausbildungsanstalten für ihre Angestellten errichteten. Jüngste Aenderungen in vielen grossen Eisenbahnsystemen haben sich, besonders nach dem zweiten Weltkrieg, in beträchtlicher Weise auf die feststehenden Ausbildungsprogramme ausgewirkt. Die grosse Anzahl ihrer technischen Mitarbeiter nötigt die meisten Eisenbahnen, ihre Ausbildungsanstalten auszubauen und den Unterricht zu intensivieren, um den erhöhten Ansprüchen gerecht zu werden. Ausserdem fordern die neuesten technischen Entwicklungen die Aufstellung eines Umschulungsprogramms. In einer internationalen Rundfrage, herausgegeben von der Internationalen Arbeitsorganisation wird dieses Thema von verschiedenen Seiten belichtet.

Las diversas técnicas ferroviarias siempre han requerido una formación especial para ciertas categorías de ferroviarios. En el mundo entero muchos ferrocarriles han establecido clases de formación y programas de aprendizaje. Los cambios de la posguerra han repercutido considerablemente en los programas de formación de muchos ferrocarriles. El gran número de empleados y las exigencias de una operación satisfactoria obligan a intensificar y expander las posibilidades de formación. Además, recientes desarrollos técnicos requieren que se establezcan nuevos programas de reeducación. Una encuesta mundial publicada por la International Labor Organization pone de manifiesto tales tendencias.

• **British Railways:** Established training courses for all levels of operating and commercial staff are being enlarged. In addition, where necessary, provision has been made to retrain personnel affected by modernization changes. In 1959 a standardized procedure for training motor men and electric locomotive drivers was introduced. The courses include both practical and theoretical training, one third of the time being spent on practical aspects and two-thirds on theoretical. A workshop apprenticeship plan is also in operation, which employs some 11,000 apprentices who undergo intensive training in a variety of equipment and construction work. Training is also available for railway commercial staff and for junior and middle management grades. This includes courses for traffic apprentices who have recently completed their railway training. Training programs for civil engineering staff are being developed. University training is being arranged for men in the electric traction division and engineering supervisors. In addition, much importance is being attached to training for top management posts. Effort has also been devoted to improving working practices through the training of supervisory employees and others in work study.

• **Canada:** The unions have suggested to the Government that retraining programs should be provided for railwaymen who lose their jobs as a result of the introduction of new techniques or the abandonment of services.

• **East Africa:** Training school was opened in Nairobi in 1956.

• **German Federal Railway:** Special courses in a number of categories have been organized for periods of six weeks to three months. Special training has also been found necessary for the men assigned to new signaling and traffic control centers. In the case of the central control post at Frankfurt, for instance, new operators are required to take a four months' course to prepare for new duties, while the chief of the central safety service requires some 14 months training. Similarly the personnel engaged on maintenance of signals and switches who have considerable responsibility are given full training.

• **India:** Selected men trained by manufacturers where modernization has principally occurred in the traction department.

• **Italy:** Steps are being taken to provide specialized and advanced vocational training facilities to enable employees to qualify for highly skilled and better paid jobs in keeping with the changes which are being made in traction equipment, rolling stock and permanent way installations.

• **Japanese National Railways:** Extensive and educational training facilities. The Central Railway Training School in Tokyo provides a wide range of training for all levels of staff, in addition to which there are seven divisional railway schools and 28 apprenticeship training schools. These facilities are also available for training selected staff from other countries in the region.

• **Latin America:** A growing recognition of the need to improve existing training facilities and to enlarge and modernize programs of instruction for railwaymen. This was one of the major topics of study at the Ninth and Tenth Pan-American Railway Congresses where a number of technical papers were presented on this question. Such facilities already exist to some extent in certain countries. In Mexico, for instance, the difficulties caused by lack of properly trained personnel have been recognized and companies have created a number of training centers. Recent views are that these need to be concentrated at a few strategic centers on the Mexican Railways, their facilities enlarged and the methods unified.

• **Netherlands:** Specialized and advanced vocational training facilities are in effect.

• **New Zealand:** Training and retraining courses are provided as a matter of routine whenever this is necessary.

• **Norway:** Training and retraining courses are provided.

• **Pakistan:** The training center in Lahore for railway operating and signaling officers—originally set up jointly by the United Nations and the Goverment of Pakistan—also provides training (particularly in improving the operating capacity of single track lines through CTC and changes in signaling methods) to railway staff personnel from all countries of the region. Falicities at other national railway training centers have been made available for training of exchange personnel from other countries.

• **South Africa:** Railway training and apprenticeship programs are now available.

• **Switzerland:** Specialized courses are organized when new methods of work or modernized installations are introduced.

• **Sweden:** Similar arrangements to other countries. In addition to establishing training courses for footplate personnel and various categories of repair and maintenance staff, special retraining

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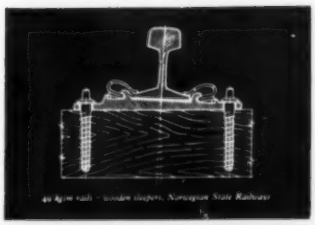

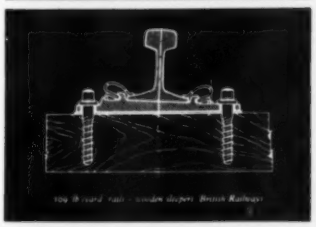

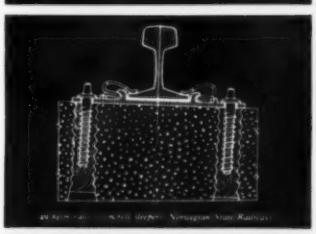

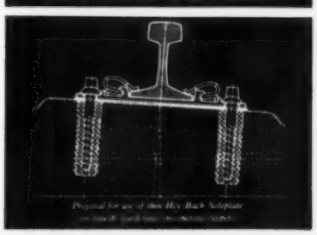

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WORLD POLL

CONTINUED

programs have been initiated to adapt redundant workers to their new duties. The practice is to send selected groups of staff to study new equipment during manufacture.

• **Taiwan:** Selected men have been trained by representatives of the manufacturers in the operation and servicing of new diesel locomotives. These men in turn have retrained drivers, selected mechanics and electricians, and a trained force adequate to service the new equipment is generally reported to be available. Training classes have also been started in connection with centralized traffic control.

• **Tunisia:** Railway training and apprenticeship programs are available, with technical assistance from the International Labor Organization.

• **USA:** Railwaymen generally acquire their skills through training on the job, and eventually move to higher skilled jobs on the basis of seniority and experience when posts become vacant. However, when further training is required before the duties of the job can be adequately handled, the employee is sometimes afforded an opportunity to "break in" on the job on his own initiative and without pay for such time. In recent years the need for specialized training has been recognized by a number of railway companies, who have set up various training facilities. In addition, many railways now use instruction cars for diesel and other equipment to carry these instruction programs to key points on their lines.

• **USSR:** Training for all categories of railwaymen, from first-line levels up to and including engineering and management staff, has been fully developed. There is a large network of colleges, secondary schools and technical schools, providing day teaching as well as night classes, and correspondence courses, and other forms of training and improvement of professional skill for railway personnel. Twelve colleges train engineers in various fields of railway work, and complementary correspondence and evening training courses have been greatly developed in recent years. Middle level personnel are trained in 81 technical schools, besides which there are a number of railway training schools for lower-level personnel, at which training lasts from five to ten months. There are shorter courses for lower skilled workers.

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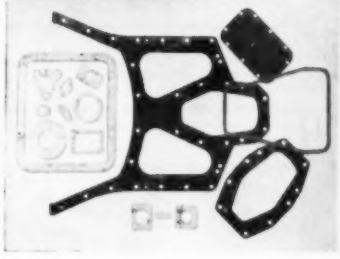

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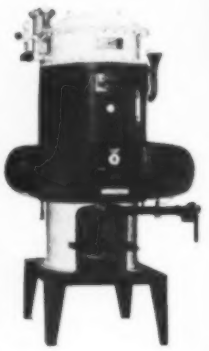

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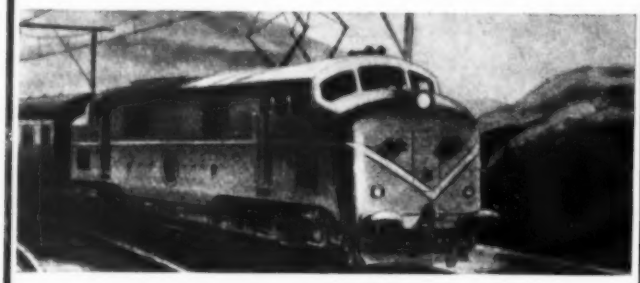

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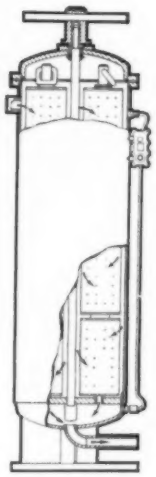

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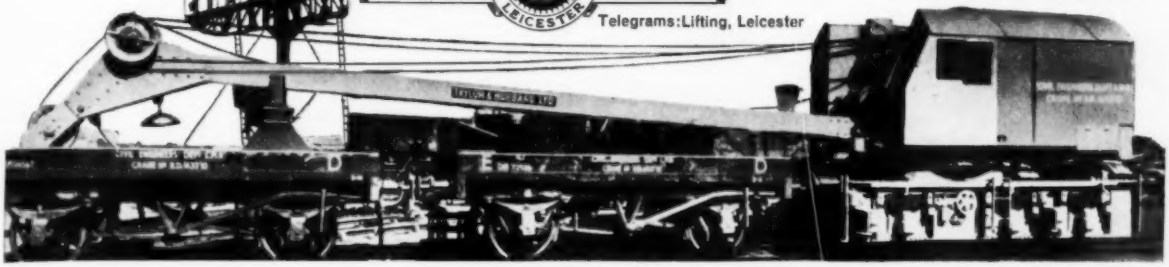

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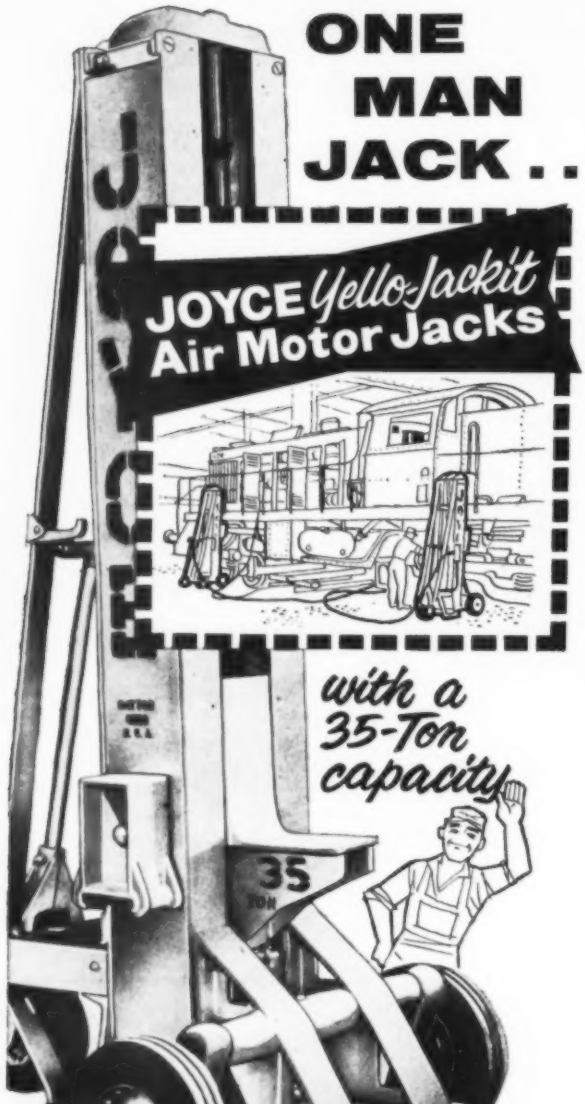

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After Hours with

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SIX OF ONE — There seems to be less difference than one might expect between problems of railway enterprises run for profit, and those whose main concern is for some social objectives of the state. In either case, management is under continuous pressure to operate as economically as possible. Whether the goal aimed at is an actual profit, or only the minimizing of a deficit—the effect on management's duties is identical.

State-owned enterprises vary in the degree of their responsibility to political authorities—some being almost completely independent, while others are (shall I say?) less so. In any event, railways completely in private ownership often have burdens laid upon them by government which are fully as onerous as those carried by state-owned undertakings (eg., maintenance of unremunerative services).

Before me, I have a copy of the Victorian Railways News wherein the responsible Commissioners speak with complete frankness about the "inevitable" deficit they are incurring because of "pressure group" requirements that services be provided which do not pay their way. The privately-owned railways in the US have an identical problem, for example, in the movement of fruits and vegetables from certain areas—which must be moved at rates which do not meet direct costs.

BIGGEST ECONOMIC PROBLEM — From my correspondence, and reading of railway literature, there seems to be one highly important economic problem which confronts practically all railway administrations. This is the problem of so adjusting rates in relation to railway costs that railways will attract the traffic which they can handle most economically, while encouraging traders to use highway and other transport services where costs of these other transport modes are lower.

Railways have the devil's own time in making this adjustment in their rates—especially where their rates are regulated by government and where highway carriers are politically strong, because many road transport enterprises seem to prefer the longer hauls. This is true even where their costs are less favorable than those of the railways.

In the long run, all transport enterprises are put at a disadvantage by uneconomic division of traffic between the several modes of carriage—because, if transport costs are thereby made unnecessarily high, traders are induced to seek substitutes for transport (eg., decentralization of production).

NOTICE TO READERS

In accordance with customary practices, the August and September issues of International Railway Journal will be combined. This combined issue will be published September 1.

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RESUMEN

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Esta es la camioneta que viaja sobre rieles. El modelo Fairmont A 300 es un coche espacioso que tiene capacidad para ocho pasajeros con todo confort. Impulsado por un motor de gasolina International Harvester, de 6 cilindros y de 140 HP, este elegante vehículo viaja a velocidades de hasta 80 kilómetros por hora sobre vías de primera clase. El engranaje direccional permite usar todas las tres velocidades lo mismo al frente que en marcha atrás, y basta un operario para girarlo en redondo, usando la tornamesa hidráulica integral, de acción manual. Este carro tiene frenos hidráulicus de automóvil para mayor seguridad, así como ruedas resistentes de acero fundido. El A 300 puede obtenerse para anchos de vía desde 91,5 cm hasta 167.6 cm. En los modelos para vía estrecha los muelles están localizados fuera de las ruedas, para mayor estabilidad. También sa ofrece el modelo con carrocería de ambulancia. Escriba para más informes.

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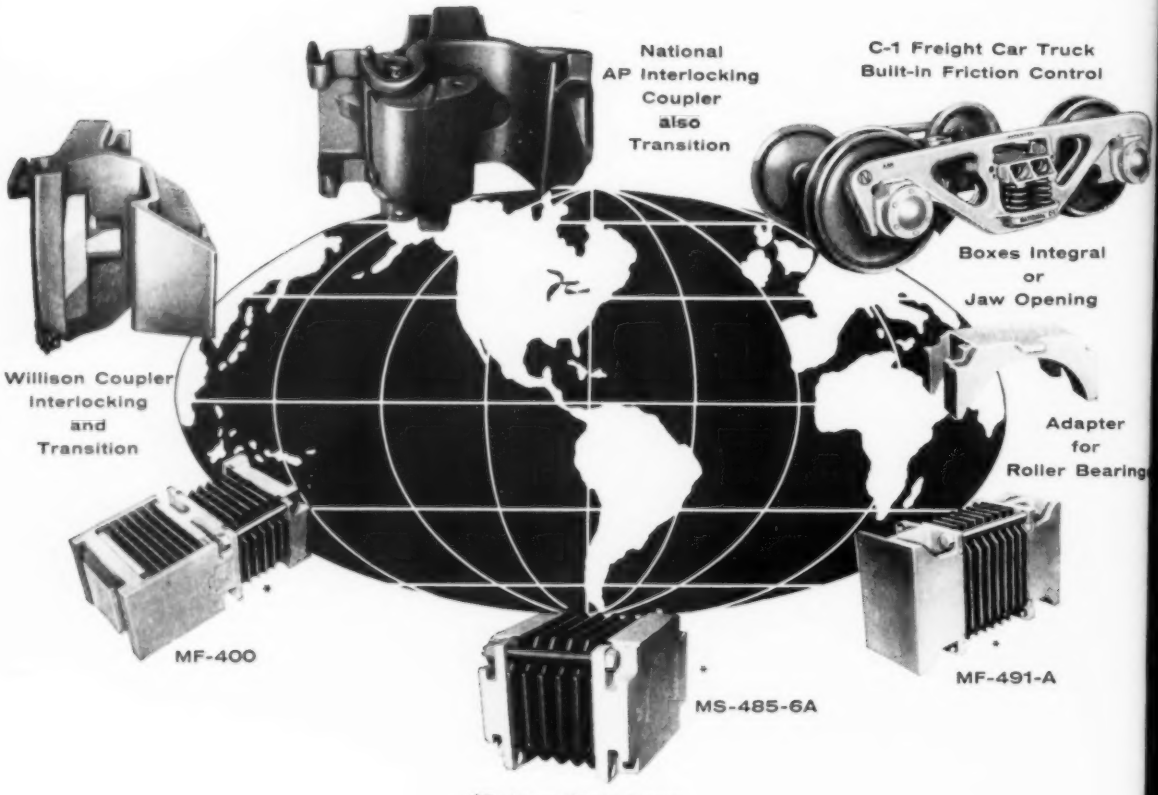

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